

Date: March 08, 2017 Job No.: 5475-02  
To: Blythe Robinson, Executive Director  
Cc: Meghan Jop, Assistant Executive Director  
From: Kien Ho, P.E., PTOE  
Tyler de Ruiter, P.E.  
Subject: Wellesley – “High Level” Traffic Evaluation of Elementary School Consolidation / Redistricting

---

BETA Group, Inc. (BETA) has completed the “High Level” traffic evaluation for the potential consolidation of Hardy, Hunnewell, and Upham Schools in Wellesley, Massachusetts. In collaboration with the Town, 21 key intersections were identified for the “high level” evaluation. These 21 study area intersections were examined to evaluate any potential traffic impacts with respect to four scenarios developed by the Town. These scenarios included:

- Scenario A – Expand Hunnewell School and Upham School with no Hardy School
- Scenario B – Expand Hardy School and Hunnewell School with no Upham School
- Scenario D – Expand Hardy School and Hunnewell School with no Upham School
- Scenario E – Maintain all seven elementary schools with slight changes in districts to balance student populations

In addition to elementary school consolidation, each scenario develops new districts for each of the remaining schools. The redistricting will potentially impact five schools: Bates School, Hardy School, Hunnewell School, Sprague School, and Upham School. It is not expected that the redistricting scenarios will impact Fiske School or Schofield School.

It should be noted that Scenario C was removed from consideration during the evaluation process as the Town determined a new school on the North 40 property was not a viable option.

The following memorandum provides a summary of the traffic evaluation methodology and findings.

## EXISTING CONDITIONS

### FIELD OBSERVATIONS

Existing school operations were observed at the five elementary schools during the morning drop-off peak and the afternoon pick-up peak. Conditions were observed at Hardy School, Hunnewell School, and Sprague School on Thursday, December 15<sup>th</sup>, 2016. Bates School and Upham School were observed on Tuesday, December 20<sup>th</sup>, 2016.

Observations included examining overall operations and travel patterns, such as on-site and off-site circulation and queueing, during school peak periods. This exercise was beneficial to validating traffic data and determining trip distribution discussed in subsequent sections of this memorandum.

### TRAFFIC DATA COLLECTION

Turning Movement Counts (TMC) were collected at 21 intersections in Wellesley on Thursday, December 15<sup>th</sup>, 2016 during the morning commuting peak period (7:00-9:00AM) and afternoon school release period (2:00-4:00PM). Morning peak hours were found to vary between 7:30 and 9:00AM. Afternoon peak hours

were found to vary between 2:00 and 4:00PM. To provide a conservative analysis, individual intersection peak hours were examined.

The 21 intersections are displayed in Figure 1 and included:

1. Weston Road at Elmwood Road
2. Weston Road at Pilgrim Road
3. Weston Road at Route 9 West / Cleveland Road
4. Weston Road at Route 9 East
5. Weston Road at Hardy Road
6. Weston Road at Turner Road / Avon Road
7. Weston Road at Linden Street
8. Weston Road at Central Street (Route 135)
9. Linden Street at Crest Road
10. Central Street (Route 135) at Washington Street (Route 16) / Grove Street
11. Washington Street (Route 16) at Wellesley Avenue (Route 135) and Brook Street
12. Washington Street (Route 16) at State Street / Kingsbury Street
13. Route 9 at Westgate Road / Oak Street
14. Route 9 at Westbound U-Turn
15. Route 9 at Eastbound U-Turn
16. Route 9 at Cliff Road
17. Cliff Road at Lowell Road
18. Bristol Road at Lowell Road
19. Bristol Road at Wynnewood Road / Oakridge Road
20. Suffolk Road at Dukes Road / Bucknell Road
21. Westgate Road at Pilgrim Road

Existing peak hour TMC are displayed in Figures 2A-2D. All raw traffic volume data sheets are provided in the Appendix.

#### *ROUTE 9 AT KINGSBURY STREET*

It should be noted that Route 9 at Kingsbury Street was also analyzed as part of this evaluation. Traffic data for this intersection was obtained by MassDOT as part of their signal improvements study for the Route 9 U-Turns and Kingsbury Street. The Route 9 at Kingsbury Street intersection improvements are expected to begin in Spring 2017 with completion by 2018 and include installing traffic signals at both Route 9 U-Turns with updated signal timings at Kingsbury Street.

## BACKGROUND GROWTH

To examine future conditions, the existing 2016 TMC were increased by 1% per year for six years to obtain the 2022 No-Build TMC included in Figures 3A-3D. The increase in traffic growth is expected to include any area changes in development. The six year build out condition is an industry standard practice to determine future conditions with the understanding that it will be some time before the consolidation and redistricting completes. The annual growth of 1% per year is consistent with historical planning and intersection studies throughout the Town of Wellesley.

It is important to note that the *Wellesley Public School Enrolment Projection Update*, dated October 25, 2016; indicated that the projected student enrollment for Wellesley Elementary Schools are expected to

decrease when compared to the existing 2016-2017 student enrollment. Since student count is not expected to increase in the future, traffic volumes into and out of Hardy Road (which functions as a school driveway) were not inflated as part of the background growth exercise.

## BUILD CONDITIONS

### TRIP GENERATION AND TRIP DISTRIBUTION

Each scenario was compared with the existing school districting map to determine which areas within the existing districts will change as a result of the potential school redistricting. BETA utilized elementary school student population data from the Town to determine the number of households with elementary school students within each of these areas. For the purposes of this study, the trip generation exercise used the following assumptions:

Assumption 1 - Each household with elementary school students represents one vehicle trip regardless of the number of elementary school students that reside there.

Assumption 2 - All households will drive to their new school. BETA discussed the school busing component with the school Transportation Department. The number of existing school buses, eligible students, and non-eligible students who currently ride the bus during existing conditions were examined and discussed. Based on the low ridership numbers, particularly for eligible students (those residing two miles from the school) it was assumed that the number of students taking the bus would be negligible. Similarly, all redistricted students that may currently walk to school will be converted to vehicle trips. Using Scenario A as an example, the students currently walking to Hardy School would drive to their new school (Sprague School). This provides a conservative analysis from a traffic standpoint.

Based on these maps and the student data, the number of trips to be moved and which areas they will move to/from were determined. Table 1 shows a comparison of the total number of households that will be redistributed (Trip Generation) as a result of each redistricting scenario. The trip generation and distribution maps are provided in the Appendix.

Table 1: Trip Generation Comparison

Scenario	Redistributed Households
A	395
B	354
D	240
E	85

As seen in the table, Scenario A was found to redistribute the most households while Scenario E redistributes the least amount of households. The trip generation and distribution maps are provided in the Appendix.

### TRIP DISTRIBUTION AND ASSIGNMENT

With an understanding, at a high level, of where traffic will be moving to and from as a result of the redistricting, traffic volumes were distributed throughout the roadway network and through each of the 21

study area intersections. Critical or key travel paths were determined for each area that will change districts from their home to the school. It is understood that many people may have a tendency to make school drop-off and pick-up an intermediate trip on the way to some other destination such as work.

Assumption 3 - For the purposes of this study, it was assumed that all trips originate at home, travel to school, and then travel back to their home for both the morning and afternoon peak periods.

It is also understood that school traffic is generally higher in the morning with fewer vehicle trips in the afternoon given students may utilize after school programs or other after school activities, e.g. traveling home with friends.

Assumption 4 - For the purposes of this study, it was assumed that the number of trips in the morning is similar to the number of trips in the afternoon.

These assumptions provide a conservative analysis without artificially inflating the trip generation when compared to the existing roadway network and traffic patterns. Examples of trip distribution maps are provided in the Appendix. These maps show the overall roadway network with red lines denoting the new travel path for redistricted households. Using these travel paths, the number of redistricted households (trips) was assigned to turning movements at each of the study area intersections.

Assumption 5 - Since the Town does not project an increase in student enrollment, the redistricting effort is not expected to increase the overall number of students in the Town. Therefore, it is assumed that the overall number of trips in the Town will remain constant. With this regard, trips are assigned to new travel paths and removed from their previous travel path. This results in a net zero change in overall traffic throughout the town.

Consistent with Assumption 5, the number of redistricted households (trips) were removed from their expected existing travel path and added to turning movements along their new travel path.

These volumes are provided in Figures 4A-5D.

## 2022 BUILD TMC

To obtain the 2022 Build volumes for Scenarios A, B, D, and E, the corresponding trip assignment was added or subtracted to the 2022 No-Build TMC discussed previously. The resulting 2022 Build volumes are provided in Figures 6A-9D.

## TRAFFIC ANALYSIS

To evaluate changes in traffic conditions during the existing, no-build, and build scenarios, a capacity (level of service) analysis was performed. This analysis was performed using methods of the 2000 *Highway Capacity Manual* published by the Transportation Research Board. For intersections, six levels of service (LOS), "A"- "F", have been established with "A" representing very good operation and "F" representing very poor operation. For signalized and unsignalized intersections, level of service is defined in terms of total delay and is computed for individual intersection turning movements. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time. The relationship between LOS and delay is summarized in Table 2.

Table 2: Level of Service Criteria

LOS	Unsignalized and Roundabout Intersection Criteria Average Total Delay (Seconds per Vehicle)	Signalized Intersection Criteria Average Total Delay (Seconds per Vehicle)	General Description
A	< 10.0	< 10.0	Free Flow
B	10.1 to 15.0	10.1 to 20.0	Stable flow (slight delays)
C	15.1 to 25.0	20.1 to 35.0	Stable flow (acceptable delays)
D	25.1 to 35.0	35.1 to 55.0	Approaching unstable flow (tolerable delay)
E	35.1 to 50.0	55.1 to 80.0	Unstable flow (intolerable delay)
F	> 50.0	> 80.0	Forced flow (jammed)

A level of service analysis was performed for the study intersections using Trafficware's Synchro software package (Version 8.0, Build 806.61). A summary of the analysis results for the morning peak hour are provided in Table 3, while a summary of analysis results for the afternoon peak hour are provided in Table 4. Each table provides a comparison of the 2016 Existing, 2022 No-Build, and 2022 Build Scenarios A, B, D, and E. Columns providing traffic analysis for the 2022 Build Scenarios were color coded for ease of review. Intersections that are colored green were found to improve when compared to analysis conditions in the 2022 No-Build. Intersections colored red were found to degrade when compared with the 2022 No-Build. Finally, intersections colored yellow were found to have no significant difference when compared to the 2022 No-Build. For comparison purposes, intersections were deemed to be red or green if the average delay or 95<sup>th</sup> percentile queue increased or decreased by approximately 30% for individual approaches (unsignalized) or overall (signalized). In some cases, a change of 30% was found to be relatively small in comparison with the 2022 No-Build conditions. In these cases, the intersection was colored yellow (no significant change) even if the 30% rationale may have been satisfied. Complete analysis results are provided in the Appendix.

As noted above, average total delay per vehicle is displayed with the corresponding level of service. The tables also provide the volume to capacity ratio (v/c) for each approach or lane use. Lane uses and approaches with v/c ratios greater than 1.0 operate over capacity and are attributed with LOS F even if the delay is less than 50 (unsignalized) or 80 seconds (signalized). The queue lengths shown in the table represent the 95<sup>th</sup> percentile queues. The 95<sup>th</sup> percentile queue represents the queue length that has only a 5% chance of being exceeded during the peak hour.

The Synchro traffic analysis program examines conditions both at controlled approaches (Stop Signs and Signals) and uncontrolled approaches, particularly for left turns that must stop for oncoming traffic. Due to program calibration limitations, the uncontrolled movements were found to operate with minimal delays and queues that may not represent field conditions. Based on field observations, Weston Road is currently very congested due to several turning movements towards side streets and a frequently activated pedestrian signal (controlled by a crossing guard) which stop traffic generating queues. This analysis does not represent the existing disturbance in traffic, as the program assumes traffic on uncontrolled roadways is free flow. To minimize confusion, Table 3 and Table 4 only summarize controlled (Stop Sign or Traffic Signal) approaches to study area intersections. A more refined traffic analysis calibration will be performed to examine mitigation measures for the selected scenario.

Table 3: Morning Peak Hour LOS Summary

INTERSECTIONS	Morning Peak Hour																							
	2016 Existing				2022 No-Build				2022 Build - Scenario A				2022 Build - Scenario B				2022 Build - Scenario D				2022 Build - Scenario E			
	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue
1. Weston Road at Elmwood Road [UNSIGNALIZED]																								
Elmwood - WB	F	242.3	> 1.0	284	F	*	> 1.0	355	F	*	> 1.0	844	F	256.2	> 1.0	226	F	256.2	> 1.0	226	F	*	> 1.0	355
2. Weston Road at Pilgrim Road [UNSIGNALIZED]																								
Pilgrim - WB	E	47.3	0.44	49	F	60.4	0.53	63	F	75.8	0.60	74	F	167.9	> 1.0	180	F	70.4	0.62	80	F	60.4	0.53	63
3. Weston Road at Cleveland Road / Route 9 West Ramp [UNSIGNALIZED]																								
Rte 9 West - EB	F	77.9	0.91	201	F	131.2	> 1.0	273	F	59.0	0.86	194	F	266.4	> 1.0	378	F	193.9	> 1.0	328	F	131.2	> 1.0	273
Cleveland - WB	F	**	> 1.0	**	F	**	> 1.0	**	F	**	> 1.0	**	F	**	> 1.0	**	F	**	> 1.0	**	F	**	> 1.0	**
4. Weston Road at Route 9 East Ramp / Driveway [UNSIGNALIZED]																								
Rte 9 East - EB	F	*	> 1.0	713	F	**	> 1.0	**	F	*	> 1.0	728	F	**	> 1.0	**	F	**	> 1.0	**	F	**	> 1.0	**
5. Weston Road at Hardy Road [UNSIGNALIZED]																								
Hardy - WB	F	215.0	> 1.0	337	F	284.2	> 1.0	380	-	-	-	-	F	*	> 1.0	795	F	*	> 1.0	558	F	284.2	> 1.0	380
6. Weston Road at Turner Road / Avon Road [UNSIGNALIZED]																								
Turner - EB	D	28.1	0.22	20	D	32.9	0.26	25	F	87.5	0.70	94	F	68.2	0.62	80	D	31.7	0.26	24	D	33.2	0.26	26
Avon - WB	C	18.8	0.08	7	C	20.2	0.10	8	F	50.0	0.53	66	F	51.6	0.41	44	C	24.4	0.06	5	C	20.2	0.10	8
7. Weston Road at Linden Street [UNSIGNALIZED]																								
Linden - WB	C	21.5	0.35	39	C	24.6	0.39	46	C	23.1	0.39	45	C	22.1	0.39	45	C	22.1	0.39	45	C	22.1	0.39	45
8. Weston Road at Central Street [SIGNALIZED]																								
Central - EBL	B	17.8	0.52	162	B	18.3	0.55	172	B	18.0	0.55	172	B	18.0	0.55	172	B	18.0	0.55	172	B	18.0	0.55	172
Central - EBTR	C	29.0	0.82	#584	C	30.0	0.83	#640	C	29.4	0.82	#640	C	29.4	0.82	#640	C	29.4	0.82	#640	C	29.4	0.82	#640
Central - WB	C	29.2	0.55	172	C	28.7	0.52	183	C	28.3	0.52	183	C	28.3	0.52	183	C	28.3	0.52	183	C	28.3	0.52	183
Weston - NB	F	*	> 1.0	#1,152	F	*	> 1.0	#1,241	F	*	> 1.0	#1,222	F	*	> 1.0	#1,222	F	*	> 1.0	#1,222	F	*	> 1.0	#1,222
Weston - SB	C	33.5	0.84	#489	D	45.8	0.91	#530	D	43.7	0.90	#514	D	43.7	0.90	#514	D	43.7	0.90	#514	D	43.7	0.90	#514
OVERALL	F	154.3	> 1.0	-	F	191.1	> 1.0	-	F	186.4	> 1.0	-	F	186.4	> 1.0	-	F	186.4	> 1.0	-	F	186.4	> 1.0	-
9. Linden Street at Crest Road [SIGNALIZED]																								
Linden - EB	D	36.4	0.79	#398	D	41.1	0.83	#436	D	40.2	0.82	#427	D	39.8	0.80	#418	D	39.8	0.80	#418	D	39.8	0.80	#418
Linden - WBL	D	38.3	0.68	#178	D	42.6	0.73	#201	D	42.6	0.73	#201	D	42.2	0.67	#201	D	42.2	0.67	#201	D	42.2	0.67	#201
Linden - WBTR	B	11.5	0.18	97	B	12.1	0.20	104	B	12.1	0.19	101	B	12.1	0.17	96	B	12.1	0.17	96	B	12.1	0.17	96
Crest - NB	D	37.7	0.82	#397	D	40.4	0.85	#432	D	40.4	0.85	#432	D	39.8	0.83	#432	D	39.8	0.83	#432	D	39.8	0.83	#432
Crest - SB	C	21.3	0.20	84	C	21.8	0.21	89	C	21.8	0.21	89	C	21.6	0.21	89	C	21.6	0.21	89	C	21.6	0.21	89
OVERALL	C	32.5	0.75	-	D	35.6	0.78	-	D	35.3	0.78	-	D	35.1	0.78	-	D	35.1	0.78	-	D	35.1	0.78	-
10. Washington Street at Grove Street / Central Street [SIGNALIZED]																								
Central - EB	D	48.0	0.82	349	D	48.9	0.84	373	D	49.3	0.85	381	D	49.3	0.85	381	D	49.3	0.85	381	D	49.3	0.85	381
Washington - WBL	F	*	> 1.0	#418	F	*	> 1.0	#443	F	*	> 1.0	#442	F	*	> 1.0	#442	F	*	> 1.0	#442	F	*	> 1.0	#442
Washington - WBTR	B	16.2	0.56	442	B	16.8	0.59	486	B	16.8	0.59	486	B	16.8	0.59	486	B	16.8	0.59	486	B	16.8	0.59	486
Grove - NB	E	67.7	0.88	#430	F	87.3	0.96	#465	F	101.8	> 1.0	#488	F	101.8	> 1.0	#488	F	101.8	> 1.0	#488	F	101.8	> 1.0	#488
Grove - SB	D	36.7	0.28	120	D	37.6	0.30	125	D	37.8	0.30	125	D	37.6	0.30	125	D	37.6	0.30	125	D	37.6	0.30	125
Washington - NEB	C	34.5	0.50	226	D	36.0	0.54	243	D	36.3	0.54	243	D	36.3	0.54	243	D	36.3	0.54	243	D	36.3	0.54	243
OVERALL	F	121.2	> 1.0	-	F	134.7	> 1.0	-	F	136.0	> 1.0	-	F	136.0	> 1.0	-	F	136.0	> 1.0	-	F	136.0	> 1.0	-
* Delay exceeds 300 seconds ** Volume greatly exceeds capacity. m Volume for 95th percentile queue is metered by upstream signal. # 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after 2 cycles.																								



INTERSECTIONS	Morning Peak Hour																							
	2016 Existing				2022 No-Build				2022 Build - Scenario A				2022 Build - Scenario B				2022 Build - Scenario D				2022 Build - Scenario E			
	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue
11. Washington Street at Wellesley Avenue / Town Hall [SIGNALIZED]																								
Washington - EBLT	C	24.5	0.78	#424	C	24.6	0.79	#464	C	24.8	0.79	#475	C	24.8	0.79	#475	C	24.8	0.79	#475	C	24.6	0.79	#464
Washington - EBR	A	1.8	0.34	23	A	1.8	0.36	23	A	1.9	0.39	24	A	1.9	0.39	24	A	1.9	0.39	24	A	1.8	0.36	23
Washington - WB	B	16.8	0.52	139	B	16.9	0.54	151	B	17.2	0.56	156	B	17.2	0.56	156	B	17.2	0.56	156	B	16.9	0.54	151
Wellesley - NB	C	22.3	0.76	#475	C	28.0	0.83	#516	C	28.7	0.84	#515	C	28.7	0.84	#515	C	28.7	0.84	#515	C	28.0	0.83	#516
OVERALL	B	16.2	0.79	-	B	17.8	0.83	-	B	17.8	0.83	-	B	17.8	0.83	-	B	17.8	0.83	-	B	17.8	0.83	-
11A. Wellesley Avenue at Brook Street [SIGNALIZED]																								
Wellesley - EB	A	3.7	0.45	239	A	3.8	0.47	264	A	3.9	0.50	299	A	3.9	0.50	299	A	3.9	0.50	299	A	3.8	0.47	264
Wellesley - WB	A	4.0	0.36	166	A	4.0	0.38	178	A	4.0	0.38	179	A	4.0	0.38	179	A	4.0	0.38	179	A	4.0	0.38	178
Brook - NB	C	31.4	0.51	#133	C	34.1	0.55	#121	C	34.5	0.56	#121	C	34.5	0.56	#121	C	34.5	0.56	#121	C	34.1	0.55	#121
OVERALL	A	6.3	0.47	-	A	6.6	0.49	-	A	6.6	0.52	-	A	6.6	0.52	-	A	6.6	0.52	-	A	6.6	0.49	-
12. Washington Street at State Street / Kingsbury Street [SIGNALIZED]																								
Washington - EB	C	29.6	0.76	246	C	30.1	0.78	267	C	30.3	0.79	272	C	30.3	0.79	272	C	30.3	0.79	272	C	30.1	0.78	267
Washington - WB	C	23.7	0.53	153	C	23.4	0.54	165	C	23.4	0.54	165	C	23.4	0.54	165	C	23.4	0.54	165	C	23.5	0.54	165
State - NBLT	E	64.4	0.94	#423	F	91.0	> 1.0	#454	E	70.6	0.96	#401	E	70.6	0.96	#401	E	70.6	0.96	#401	F	91.1	> 1.0	#454
State - NBR	C	24.2	0.13	57	C	25.2	0.14	59	C	25.4	0.15	59	C	25.4	0.15	59	C	25.4	0.15	59	C	25.3	0.14	59
Kingsbury - SB	B	16.0	0.50	324	B	18.9	0.58	#374	B	17.3	0.50	308	B	17.3	0.50	308	B	17.3	0.50	308	B	19.1	0.58	#374
OVERALL	C	31.4	0.78	-	D	36.9	0.84	-	C	32.5	0.79	-	C	32.5	0.79	-	C	32.5	0.79	-	D	37.0	0.84	-
13. Route 9 at Westgate Road / Oak Street [UNSIGNALIZED]																								
Rte 9 - EBL	C	15.2	0.14	12	C	16.4	0.16	14	C	16.8	0.16	14	C	16.4	0.16	15	C	16.4	0.16	14	C	16.4	0.16	14
Rte 9 - WBL	F	52.5	0.69	111	F	80.1	0.84	152	F	60.5	0.70	108	F	80.1	0.84	187	F	153.6	> 1.0	264	F	57.0	0.68	104
Oak - NBR	D	32.3	0.31	32	E	38.0	0.37	40	E	39.2	0.38	41	E	38.0	0.37	38	E	38.0	0.37	40	E	38.0	0.37	40
Westgate - SBR	C	17.4	0.13	11	C	18.7	0.15	13	C	19.0	0.15	13	C	18.7	0.15	12	C	18.7	0.15	13	C	18.7	0.15	13
14. Route 9 at Westbound U-Turn [UNSIGNALIZED]																								
Rte 9 - EB	-	-	-	-	F	291.5	> 1.0	#1,949	F	291.5	> 1.0	#1,949	F	291.5	> 1.0	#1,949	F	*	> 1.0	#2,004	F	283.1	> 1.0	#1,916
Rte 9 - WBU	F	*	> 1.0	**	C	33.4	0.21	m140	C	33.6	0.21	m140	C	33.4	0.21	m140	C	33.4	0.21	m136	C	33.6	0.21	m143
Rte 9 - WBT	-	-	-	-	A	0.6	0.53	m0	A	0.6	0.53	m0	A	0.6	0.53	m0	A	0.6	0.55	m0	A	0.5	0.53	m0
OVERALL	-	-	-	-	F	165.0	> 1.0	-	F	165.0	> 1.0	-	F	165.0	> 1.0	-	F	172.8	> 1.0	-	F	160.6	> 1.0	-
14A. Route 9 at Kingsbury Street [SIGNALIZED]																								
Rte 9 - EB	F	149.1	> 1.0	#1,761	F	91.5	> 1.0	m85	F	91.5	> 1.0	m85	F	91.5	> 1.0	m85	F	101.5	> 1.0	m84	F	85.5	> 1.0	m85
Rte 9 - WB	A	2.8	0.66	398	B	11.4	0.94	m85	B	11.4	0.94	m85	B	11.4	0.94	m85	B	12.7	0.97	m97	B	10.6	0.93	m84
Kingsbury - NB	E	55.0	0.84	335	F	212.4	> 1.0	#672	F	212.4	> 1.0	#672	F	212.4	> 1.0	#672	F	213.1	> 1.0	#674	F	212.4	> 1.0	#672
OVERALL	F	80.0	> 1.0	-	F	72.2	> 1.0	-	F	72.2	> 1.0	-	F	72.2	> 1.0	-	F	77.3	> 1.0	-	F	69.2	> 1.0	-
15. Route 9 at Eastbound U-Turn [UNSIGNALIZED]																								
Rte 9 - EBU	F	*	> 1.0	382	D	37.4	0.33	m130	D	35.7	0.38	m152	D	37.4	0.33	m130	D	35.7	0.38	m151	C	35.0	0.33	m132
Rte 9 - EBT	-	-	-	-	B	14.6	0.89	m19	A	6.8	0.88	m172	B	14.6	0.89	m19	A	7.4	0.89	m170	A	6.9	0.88	m175
Rte 9 - WB	-	-	-	-	F	138.4	> 1.0	#1,367	F	130.4	> 1.0	#1,335	F	138.4	> 1.0	#1,367	F	144.2	> 1.0	#1,391	F	130.4	> 1.0	#1,335
OVERALL	-	-	-	-	E	67.4	0.96	-	E	59.5	0.95	-	E	67.4	0.96	-	E	65.8	0.97	-	E	59.7	0.95	-
* Delay exceeds 300 seconds ** Volume greatly exceeds capacity. m Volume for 95th percentile queue is metered by upstream signal. # 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after 2 cycles.																								

INTERSECTIONS	Morning Peak Hour																							
	2016 Existing				2022 No-Build				2022 Build - Scenario A				2022 Build - Scenario B				2022 Build - Scenario D				2022 Build - Scenario E			
	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue
16. Route 9 at Cliff Road [UN SIGNALIZED]																								
Cliff - SB	E	38.7	0.50	64	E	49.2	0.60	82	E	36.6	0.42	47	E	49.2	0.60	82	F	50.7	0.60	84	E	36.6	0.42	47
17. Cliff Road at Lowell Road [UN SIGNALIZED]																								
Lowell - EB	B	11.7	0.21	20	B	12.0	0.23	22	B	12.8	0.29	30	B	12.0	0.23	22	B	12.0	0.23	22	B	13.3	0.33	35
18. Bristol Road at Lowell Road [UN SIGNALIZED]																								
Bristol - EB	A	9.2	0.23	43	B	10.2	0.40	48	B	14.7	0.61	105	A	9.9	0.38	43	A	8.7	0.27	28	A	10.4	0.41	50
Bristol - WB	A	9.8	0.37	8	A	7.9	0.11	10	A	8.6	0.14	13	A	8.3	0.12	10	A	7.9	0.11	10	B	8.0	0.13	10
Lowell - NB	A	7.8	0.10	23	A	9.5	0.24	23	B	11.2	0.34	38	A	9.6	0.25	25	A	8.3	0.11	10	A	9.5	0.24	23
Lowell - SB	A	8.3	0.05	3	A	8.4	0.05	3	A	9.1	0.05	5	A	8.3	0.06	5	A	7.9	0.05	5	A	8.5	0.05	5
19. Bristol Road at Wynnewood Road / Oakridge Road [UN SIGNALIZED]																								
Oakridge - NB	A	9.1	0.09	8	A	9.2	0.10	8	A	9.6	0.17	16	A	10.2	0.10	8	A	9.4	0.09	7	A	9.2	0.10	8
Wynnewood - SB	B	12.1	0.28	28	B	12.5	0.30	32	C	21.1	0.65	117	B	10.9	0.06	4	B	10.1	0.05	4	B	12.8	0.32	35
20. Suffolk Road at Dukes Road / Bucknell Road [UN SIGNALIZED]																								
Dukes - NB	A	9.5	0.02	2	A	9.6	0.03	2	A	9.2	0.05	4	A	9.9	0.03	2	A	9.9	0.03	2	A	9.2	0.05	4
Bucknell - SB	A	8.5	0.01	1	A	8.5	0.01	1	A	8.3	0.01	1	A	8.6	0.01	1	A	8.6	0.01	1	A	8.3	0.01	1
21. Westgate Road at Pilgrim Road [UN SIGNALIZED]																								
Pilgrim - EB	A	9.7	0.14	12	A	9.8	0.14	13	B	10.2	0.23	22	A	9.6	0.19	17	A	9.9	0.18	16	A	9.6	0.11	9
* Delay exceeds 300 seconds ** Volume greatly exceeds capacity. m Volume for 95th percentile queue is metered by upstream signal. # 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after 2 cycles.																								



Table 4: Afternoon Peak Hour LOS Summary

INTERSECTIONS	Afternoon Peak Hour																							
	2016 Existing				2022 No-Build				2022 Build - Scenario A				2022 Build - Scenario B				2022 Build - Scenario D				2022 Build - Scenario E			
	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue
1. Weston Road at Elmwood Road [UNSIGNALIZED]																								
Elmwood - WB	D	27.6	0.40	45	D	32.6	0.47	57	F	79.7	0.91	201	D	28.9	0.32	34	D	28.9	0.32	34	D	32.6	0.47	57
2. Weston Road at Pilgrim Road [UNSIGNALIZED]																								
Pilgrim - WB	D	30.2	0.35	37	E	36.0	0.41	47	E	41.2	0.45	53	F	71.3	0.76	123	E	39.6	0.48	58	E	36.0	0.41	47
3. Weston Road at Cleveland Road / Route 9 West Ramp [UNSIGNALIZED]																								
Rte 9 West - EB	F	60.6	0.79	146	F	97.2	0.95	200	E	44.8	0.74	138	F	210.7	> 1.0	287	F	147.3	> 1.0	245	F	97.2	0.95	200
Cleveland - WB	F	*	> 1.0	494	F	*	> 1.0	580	F	*	> 1.0	497	F	**	> 1.0	**	F	**	> 1.0	**	F	*	> 1.0	580
4. Weston Road at Route 9 East Ramp / Driveway [UNSIGNALIZED]																								
Rte 9 East - EB	F	*	> 1.0	592	F	*	> 1.0	711	F	*	> 1.0	594	F	**	> 1.0	**	F	*	> 1.0	772	F	*	> 1.0	711
5. Weston Road at Hardy Road [UNSIGNALIZED]																								
Hardy - WB	D	30.8	0.44	53	E	36.0	0.49	61	-	-	-	-	F	139.1	> 1.0	346	D	29.3	0.57	83	E	36.0	0.49	61
6. Weston Road at Turner Road / Avon Road [UNSIGNALIZED]																								
Turner - EB	C	19.8	0.13	11	C	21.5	0.15	13	F	89.5	0.73	103	F	69.7	0.65	88	C	20.7	0.14	12	C	21.5	0.15	13
Avon - WB	C	18.5	0.07	6	C	19.8	0.08	6	F	54.3	0.53	65	F	57.4	0.41	43	D	27.1	0.05	4	C	19.8	0.08	6
7. Weston Road at Linden Street [UNSIGNALIZED]																								
Linden - WB	C	21.5	0.47	63	D	25.3	0.57	89	C	23.8	0.53	78	C	22.8	0.49	69	C	22.8	0.49	69	C	22.8	0.49	69
8. Weston Road at Central Street [SIGNALIZED]																								
Central - EBL	C	23.5	0.49	98	C	23.3	0.51	104	C	22.9	0.50	104	C	22.9	0.50	104	C	22.9	0.50	104	C	22.9	0.50	104
Central - EBTR	C	26.6	0.66	315	C	28.2	0.68	338	C	27.8	0.68	338	C	27.8	0.68	338	C	27.8	0.68	338	C	27.8	0.68	338
Central - WB	C	30.4	0.66	202	C	33.2	0.69	215	C	32.8	0.69	215	C	32.8	0.69	215	C	32.8	0.69	215	C	32.8	0.69	215
Weston - NB	F	209.2	> 1.0	#878	F	276.1	> 1.0	#972	F	268.1	> 1.0	#952	F	268.1	> 1.0	#952	F	268.1	> 1.0	#952	F	268.1	> 1.0	#952
Weston - SB	C	22.6	0.80	#633	C	28.8	0.86	#711	C	27.9	0.85	#692	C	27.9	0.85	#692	C	27.9	0.85	#692	C	27.9	0.85	#692
OVERALL	F	81.6	> 1.0	-	F	104.4	> 1.0	-	F	101.1	> 1.0	-	F	101.1	> 1.0	-	F	101.1	> 1.0	-	F	101.1	> 1.0	-
9. Linden Street at Crest Road [SIGNALIZED]																								
Linden - EB	D	39.5	0.75	#301	D	41.3	0.78	#328	D	40.8	0.77	#319	D	40.7	0.76	#309	D	40.7	0.76	#309	D	40.7	0.76	#309
Linden - WBL	D	40.0	0.77	#310	D	41.5	0.79	#337	D	41.3	0.79	#337	D	41.1	0.79	#337	D	41.1	0.79	#337	D	41.1	0.79	#337
Linden - WBTR	B	13.6	0.35	200	B	13.5	0.37	214	B	13.5	0.36	211	B	13.5	0.36	207	B	13.5	0.36	207	B	13.5	0.36	207
Crest - NB	D	36.3	0.82	#454	D	45.7	0.89	#489	D	45.1	0.89	#489	D	44.2	0.88	#489	D	44.2	0.88	#489	D	44.2	0.88	#489
Crest - SB	C	20.1	0.12	52	C	21.1	0.13	54	C	21.0	0.13	54	C	20.8	0.13	54	C	20.8	0.13	54	C	20.8	0.13	54
OVERALL	C	31.7	0.76	-	D	35.2	0.79	-	C	34.9	0.79	-	C	34.6	0.79	-	C	34.6	0.79	-	C	34.6	0.79	-
10. Washington Street at Grove Street / Central Street [SIGNALIZED]																								
Central - EB	D	36.9	0.73	214	D	37.7	0.75	228	D	38.2	0.76	234	D	38.2	0.76	234	D	38.2	0.76	234	D	38.2	0.76	234
Washington - WBL	F	*	> 1.0	#517	F	*	> 1.0	#548	F	*	> 1.0	#548	F	*	> 1.0	#548	F	*	> 1.0	#548	F	*	> 1.0	#548
Washington - WBTR	B	12.4	0.59	424	B	13.0	0.62	465	B	13.0	0.62	465	B	13.0	0.62	465	B	13.0	0.62	465	B	13.0	0.62	465
Grove - NB	F	*	> 1.0	#464	F	*	> 1.0	#496	F	*	> 1.0	#514	F	*	> 1.0	#514	F	*	> 1.0	#514	F	*	> 1.0	#514
Grove - SB	D	38.7	0.58	#148	D	41.0	0.62	#159	D	40.6	0.62	#158	D	40.6	0.62	#158	D	40.6	0.62	#158	D	40.6	0.62	#158
Washington - NEB	C	22.3	0.27	108	C	22.8	0.29	116	C	22.9	0.29	116	C	22.9	0.29	116	C	22.9	0.29	116	C	22.9	0.29	116
OVERALL	F	243.2	> 1.0	-	F	271.0	> 1.0	-	F	275.8	> 1.0	-	F	275.8	> 1.0	-	F	275.8	> 1.0	-	F	275.8	> 1.0	-
* Delay exceeds 300 seconds ** Volume greatly exceeds capacity. m Volume for 95th percentile queue is metered by upstream signal. # 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after 2 cycles.																								

INTERSECTIONS	Afternoon Peak Hour																							
	2016 Existing				2022 No-Build				2022 Build - Scenario A				2022 Build - Scenario B				2022 Build - Scenario D				2022 Build - Scenario E			
	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue
11. Washington Street at Wellesley Avenue / Town Hall [SIGNALIZED]																								
Washington - EBLT	C	29.3	0.72	#313	C	31.4	0.75	#360	C	31.9	0.76	#372	C	31.9	0.76	#372	C	31.9	0.76	#372	C	31.4	0.75	#360
Washington - EBR	A	4.3	0.25	29	A	4.2	0.27	30	A	4.3	0.29	31	A	4.3	0.29	31	A	4.3	0.29	31	A	4.2	0.27	30
Washington - WB	B	18.0	0.61	192	B	16.3	0.46	205	B	16.3	0.46	208	B	16.3	0.46	208	B	16.3	0.46	208	B	16.3	0.46	205
Wellesley - NB	C	31.7	0.73	#483	C	34.3	0.77	#529	C	34.6	0.77	#529	C	34.6	0.77	#529	C	34.6	0.77	#529	C	34.3	0.77	#529
OVERALL	C	20.8	0.74	-	C	21.4	0.76	-	C	21.3	0.76	-	C	21.3	0.76	-	C	21.3	0.76	-	C	21.4	0.76	-
11A. Wellesley Avenue at Brook Street [SIGNALIZED]																								
Wellesley - EB	A	7.0	0.48	204	A	8.0	0.51	334	A	8.6	0.55	386	A	8.6	0.55	386	A	8.6	0.55	386	A	8.0	0.51	334
Wellesley - WB	A	9.2	0.40	254	A	10.0	0.43	273	A	9.9	0.43	273	A	9.9	0.43	273	A	9.9	0.43	273	A	10.0	0.43	273
Brook - NB	C	21.9	0.12	61	C	22.1	0.12	65	C	22.3	0.13	65	C	22.3	0.13	65	C	22.3	0.13	65	C	22.1	0.12	65
OVERALL	A	10.9	0.40	-	A	9.8	0.42	-	A	10.0	0.45	-	A	10.0	0.45	-	A	10.0	0.45	-	A	9.8	0.42	-
12. Washington Street at State Street / Kingsbury Street [SIGNALIZED]																								
Washington - EB	C	28.3	0.75	197	C	28.2	0.76	212	C	28.2	0.76	216	C	28.2	0.76	216	C	28.2	0.76	216	C	28.2	0.76	212
Washington - WB	C	24.0	0.62	188	C	23.6	0.61	200	C	23.4	0.61	200	C	23.4	0.61	200	C	23.4	0.61	200	C	23.6	0.61	200
State - NBLT	C	26.7	0.68	#304	C	32.2	0.76	#354	C	29.3	0.69	#304	C	29.3	0.69	#304	C	29.3	0.69	#304	C	32.2	0.76	#354
State - NBR	B	18.4	0.11	52	B	19.5	0.12	57	B	19.7	0.12	57	B	19.7	0.12	57	B	19.7	0.12	57	B	19.5	0.12	57
Kingsbury - SB	B	15.9	0.54	#384	B	19.4	0.63	#500	B	17.6	0.55	#406	B	17.6	0.55	#406	B	17.6	0.55	#406	B	19.4	0.63	#500
OVERALL	C	23.7	0.72	-	C	25.3	0.77	-	C	24.4	0.73	-	C	24.4	0.73	-	C	24.4	0.73	-	C	25.3	0.77	-
13. Route 9 at Westgate Road / Oak Street [UNSIGNALIZED]																								
Rte 9 - EBL	C	20.9	0.13	11	C	23.4	0.15	13	C	24.0	0.16	14	C	23.4	0.15	13	C	23.4	0.15	13	C	23.4	0.15	13
Rte 9 - WBL	D	32.0	0.55	77	E	42.2	0.65	102	E	36.0	0.55	75	E	42.2	0.65	102	F	67.3	0.86	176	D	34.4	0.54	72
Oak - NBR	C	24.8	0.24	22	D	28.0	0.28	27	D	28.7	0.28	28	D	28.0	0.28	27	D	28.0	0.28	27	D	28.0	0.28	27
Westgate - SBR	C	24.3	0.19	17	D	27.1	0.22	21	D	27.8	0.23	21	D	27.1	0.22	21	D	27.1	0.22	21	D	27.1	0.22	21
14. Route 9 at Westbound U-Turn [UNSIGNALIZED]																								
Rte 9 - EB	-	-	-	-	F	190.8	> 1.0	#1,590	F	190.8	> 1.0	#1,590	F	190.8	> 1.0	#1,590	F	204.9	> 1.0	#1,646	F	182.9	1.30	#1,559
Rte 9 - WBU	F	*	> 1.0	497	D	35.3	0.27	m151	D	35.4	0.27	m151	D	35.3	0.27	m151	D	35.4	0.27	m148	D	35.4	0.27	m153
Rte 9 - WBT	-	-	-	-	A	0.9	0.71	m0	A	0.9	0.71	m0	A	0.9	0.71	m0	A	0.9	0.73	m0	A	0.8	0.71	m0
OVERALL	-	-	-	-	F	87.9	> 1.0	-	F	87.9	> 1.0	-	F	87.9	> 1.0	-	F	94.4	> 1.0	-	F	84.2	> 1.0	-
14A. Route 9 at Kingsbury Street [SIGNALIZED]																								
Rte 9 - EB	C	23.3	0.97	#1,030	E	56.3	> 1.0	m154	E	56.3	> 1.0	m154	E	56.3	> 1.0	m154	F	66.9	> 1.0	m155	F	50.3	> 1.0	m153
Rte 9 - WB	A	9.2	0.89	#1,012	F	100.2	> 1.0	m62	F	100.2	> 1.0	m62	F	100.2	> 1.0	m62	F	107.9	> 1.0	m74	F	94.6	> 1.0	m62
Kingsbury - NB	E	57.9	0.80	#224	E	67.2	0.85	449	E	67.2	0.85	449	E	67.2	0.85	449	E	67.6	0.86	451	E	67.1	0.85	448
OVERALL	B	18.8	0.92	-	F	78.6	> 1.0	-	F	78.6	> 1.0	-	F	78.6	> 1.0	-	F	88.0	> 1.0	-	F	73.2	> 1.0	-
15. Route 9 at Eastbound U-Turn [UNSIGNALIZED]																								
Rte 9 - EBU	F	*	> 1.0	**	C	32.7	0.33	m148	C	33.4	0.38	m174	D	39.4	0.33	m149	C	33.3	0.38	m172	C	32.7	0.33	m151
Rte 9 - EBT	-	-	-	-	A	2.6	0.71	m121	A	2.6	0.70	m117	A	6.0	0.71	m15	A	2.6	0.72	m116	A	2.7	0.70	m122
Rte 9 - WB	-	-	-	-	F	316.3	> 1.0	#2,097	F	*	> 1.0	#2,065	F	316.3	> 1.0	#2,097	F	*	> 1.0	#2,122	F	*	> 1.0	#2,065
OVERALL	-	-	-	-	F	173.9	> 1.0	-	F	168.8	> 1.0	-	F	175.6	> 1.0	-	F	176.2	> 1.0	-	F	169.7	> 1.0	-
* Delay exceeds 300 seconds ** Volume greatly exceeds capacity. m Volume for 95th percentile queue is metered by upstream signal. # 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after 2 cycles.																								

INTERSECTIONS	Afternoon Peak Hour																							
	2016 Existing				2022 No-Build				2022 Build - Scenario A				2022 Build - Scenario B				2022 Build - Scenario D				2022 Build - Scenario E			
	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue	LOS	Delay (s/veh)	v/c	95%ile Queue
16. Route 9 at Cliff Road [UNSIGNALIZED]																								
Cliff - SB	F	162.8	> 1.0	229	F	250.9	> 1.0	290	F	164.8	> 1.0	211	F	250.9	> 1.0	290	F	260.7	> 1.0	295	F	164.8	> 1.0	211
17. Cliff Road at Lowell Road [UNSIGNALIZED]																								
Lowell - EB	B	11.9	0.21	20	B	12.4	0.24	23	B	13.6	0.31	33	B	12.4	0.24	23	B	12.4	0.24	23	B	14.2	0.35	39
18. Bristol Road at Lowell Road [UNSIGNALIZED]																								
Bristol - EB	A	9.2	0.22	38	A	9.7	0.36	43	B	14.9	0.63	110	A	9.4	0.33	38	A	8.2	0.22	20	A	9.9	0.38	45
Bristol - WB	A	9.4	0.34	10	A	8.2	0.14	13	A	9.0	0.18	15	A	8.6	0.15	13	A	7.9	0.13	13	A	8.3	0.16	15
Lowell - NB	A	8.1	0.13	20	A	9.4	0.24	23	B	11.3	0.36	40	A	9.6	0.24	23	A	8.0	0.08	8	A	9.4	0.23	23
Lowell - SB	A	8.1	0.02	3	A	8.1	0.02	3	A	8.9	0.03	3	A	8.0	0.03	3	A	7.5	0.03	3	A	8.2	0.02	3
19. Bristol Road at Wynnewood Road / Oakridge Road [UNSIGNALIZED]																								
Oakridge - NB	A	8.9	0.06	5	A	9.0	0.06	5	A	9.3	0.15	14	B	10.1	0.06	5	A	9.4	0.05	4	A	9.0	0.06	5
Wynnewood - SB	B	13.1	0.39	47	B	13.8	0.43	54	E	40.5	0.89	265	B	12.4	0.12	10	B	11.3	0.14	12	B	14.2	0.45	59
20. Suffolk Road at Dukes Road / Bucknell Road [UNSIGNALIZED]																								
Dukes - NB	A	9.9	0.04	3	B	10.0	0.04	3	A	9.3	0.06	5	B	10.7	0.04	3	B	10.7	0.04	3	B	9.3	0.06	5
Bucknell - SB	A	8.7	0.03	2	A	8.7	0.03	2	A	8.5	0.03	2	A	8.8	0.03	3	A	8.8	0.03	3	A	8.5	0.03	2
21. Westgate Road at Pilgrim Road [UNSIGNALIZED]																								
Pilgrim - EB	B	10.5	0.15	13	B	10.7	0.16	14	B	11.6	0.29	30	A	10.0	0.20	19	B	10.6	0.20	19	B	10.3	0.10	9
* Delay exceeds 300 seconds																								
** Volume greatly exceeds capacity.																								
m Volume for 95th percentile queue is metered by upstream signal.																								
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after 2 cycles.																								

In response to the Town's concern for queuing conditions on Weston Road and the Route 9 Interchange, BETA made additional observations of existing queuing conditions in the area of Hardy School during the morning school drop-off and afternoon school pick-up periods on Tuesday, February 28, 2017. The findings from these observations are provided in the *Weston Road Queue Observations* document provided in the Appendix.

## MORNING PEAK HOUR TRAFFIC ANALYSIS

The following section provides a summary of traffic analysis in groups similar to the traffic volume figures discussed previously.

### *WESTON ROAD - LOCATIONS 1 THROUGH 6*

As seen in Table 3, unsignalized intersections along Weston Road and the interchange with Route 9 experience delays resulting in LOS F and significant queues under existing conditions. These poor operations conditions degrade in the 2022 No-Build condition due to the background growth. Under Scenario A, Turner Road was found to degrade from LOS D to LOS F due to the redistricting of Hardy School traffic. The Route 9 ramps were found to improve due to the redistricting in Scenario A given the reduction in traffic on Weston Road, though the interchange continues to operate with poor LOS. Under Scenario B and D the only intersection found to improve was Elmwood Road. All other intersections were found to degrade slightly due to the redistricting of traffic. These two scenarios also degrade the Route 9 interchange, which is a known area of concern. Scenario E was not found to change significantly when compared to the 2022 No-Build conditions. This is due to the limited amount of redistricting in the area.

### *WELLESLEY SQUARE (ROUTE 16) – LOCATIONS 7 THROUGH 12*

The signalized intersections of Central Street at Weston Road and Washington Street at Grove Street were found to operate with LOS F during the existing conditions which degrade in the 2022 No-Build conditions. Given the relatively low amount of redistricted trips through these intersections, none of the four scenarios were found to significantly impact traffic operations for Locations 7 through 11. The intersection of Washington Street at State Street / Kingsbury Street was found to improve in Scenarios A, B, and D as a result of the reduction in traffic (40 vehicles) crossing Washington Street destined to Sprague School. In Scenario E these vehicles are not redistricted resulting in no significant change.

### *ROUTE 9 – LOCATIONS 13 THROUGH 16*

Due to the heavy eastbound traffic in the morning on Route 9, the westbound left turns towards Oak Street and the westbound U-Turn experience significant delays and queues. The eastbound direction was also found to experience LOS F in the morning at the signalized intersection of Kingsbury Street. Given the updated signals at Kingsbury Street and the U-Turns, the 2022 No-Build conditions were found to improve greatly for the U-Turns with negative impacts to eastbound and westbound through traffic on Route 9. In Scenario A and Scenario E were found to improve the intersections of Route 9 at Westgate Road /Oak Street and Route 9 at Cliff Road. This is due to the reduction in Sprague School districts north of Route 9. Added trips crossing Route 9 to Sprague School in Scenario D caused the westbound left turns at the intersection of Oak Street to further degrade from a delay of 80.1 seconds (LOS F) to 153.6 seconds (LOS F). All other intersections were found to remain relatively stable throughout each of the scenarios.

### *WELLESLEY HILLS – LOCATIONS 17 THROUGH 21*

These residential intersections were all found to operate with LOS B or better during existing and no-build conditions. Scenario A was found to increase queues and delays at the intersections of Bristol Road at Lowell Road and Bristol Road at Wynnewood Road / Oakridge Road with Wynnewood Road degrading from LOS B to LOS C. These two roads were found to degrade due to added traffic destined to Upham School. All other scenarios and intersections were not found to significantly change as a result of redistricting.

### **AFTERNOON PEAK HOUR TRAFFIC ANALYSIS**

Consistent with Assumption 4, discussed previously, which assumes the number of trips redistributed in the morning are similar to those in the afternoon, the impacts in traffic operations as a result of each scenario in the afternoon are comparable to those in the morning.

### *WESTON ROAD – LOCATIONS 1 THROUGH 6*

Under existing conditions, all roadways were found to operate with LOS D or better except for the Route 9 ramps which operate with LOS F. Traffic conditions on the controlled approaches were found to be better in the afternoon due to the lower traffic volumes, however the school traffic coupled with the pedestrian signal continue to generate congestion on Weston Road during the afternoon pick-up period. In the no-build condition, Pilgrim Road and Hardy Road were found to degrade from LOS D to LOS E. All other roadways increased in delay and queue but maintained the same letter grade. Similar to the morning condition, Scenario A was found to improve the Route 9 ramps; albeit not enough to resolve the existing traffic congestion at the interchange; while degrading Turner Road and Elmwood Road. Scenario B degraded all intersections except for Elmwood Road which improved slightly. Scenario D improved Elmwood Road and degraded the Route 9 ramps. Consistent with the morning condition, Scenario E did not significantly change any of these intersections based on the redistricting.

### *WELLESLEY SQUARE (ROUTE 16) – LOCATIONS 7 THROUGH 12*

Consistent with the morning peak hour, the signalized intersections of Central Street at Weston Road and Washington Street at Grove Street were found to operate with LOS F during the existing conditions which degrade in the 2022 No-Build conditions. Given the relatively low amount of redistricted trips through these intersections, none of the four scenarios were found to significantly impact traffic operations for Locations 7 through 11. The intersection of Washington Street at State Street / Kingsbury Street was found to improve in Scenarios A, B, and D as a result of the reduction in traffic (40 vehicles) crossing Washington Street destined to Sprague School. In Scenario E these vehicles are not redistricted resulting in no significant change.

### *ROUTE 9 – LOCATIONS 13 THROUGH 16*

Volumes on Route 9 were found to be higher in the westbound direction during the afternoon peak hour. Despite the larger number of left turns onto Oak Street, the lighter eastbound volume provides more gaps which allow this approach to operate with LOS D in the existing conditions. The U-Turns near Kingsbury Street operate with LOS F in the existing afternoon. Consistent with the morning peak hour, Scenario A and Scenario E were found to improve the intersection of Route 9 at Westgate Road / Oak Street and the intersection of Route 9 at Cliff Road due to the reduction in traffic crossing Route 9 destined to Sprague School. In Scenario D, the intersection at Oak Street was found to degrade, consistent with the morning peak hour.

### *WELLESLEY HILLS – LOCATIONS 17 THROUGH 21*

Consistent with the morning peak hour, these residential intersections operate at LOS B or better in the existing and no-build conditions. Scenario A was found to increase queues and delays at the intersections of Bristol Road at Lowell Road and Bristol Road at Wynnewood Road / Oakridge Road. The Bristol Road eastbound approach at Lowell Road degraded from LOS A to LOS B and the Wynnewood Road southbound approach degraded from LOS B to LOS E. These two roads were found to degrade due to added traffic destined to Upham School. All other scenarios were found to have no significant impact.

### ANALYSIS SUMMARY

A breakdown of the color coded analysis results shown in Table 3 and Table 4 is provided in Table 5. The table shows the total number of study intersections for each scenario broken down by color. Consistent with the previous tables: green represents intersections that were improved, yellow represents intersections that did not significantly change, and red represents intersections that degraded as a result of the school consolidation and redistricting.

Table 5: Analysis Summary Table

Scenario	Green	Yellow	Red
A	6	13	4
B	2	16	5
D	2	17	4
E	2	21	0

As seen in the table, Scenario A was found to improve the most (6) amount of intersections while only degrading four intersections. This is due to the absence of Hardy School traffic along Weston Road.

Scenarios B and D were found to degrade more intersections than they improved. This is likely because these two scenarios don't drastically alter the existing travel patterns from existing conditions with exception of those vehicles traveling past Upham School to Bates School. For example, the increase in traffic on Weston Road destined to Hardy School impacts intersections on Weston Road while the switch from Upham to Bates impacts unsignalized intersections in the Wellesley Hills area.

Scenario E was found to have little change to existing conditions. This is reflective of the changes in district for this Scenario which route most vehicles north of Route 9 to Upham School away from Route 9.

It should be noted that this summary compares traffic impacts with respect to the No-Build conditions which utilize existing intersection and roadway geometry and signal timings (with exception of MassDOT's work at Route 9 and Kingsbury Street). As a result, the impacted intersections may be mitigated in the future to improve traffic operations. Mitigation may improve some of the "red" intersections to "yellow" or even "green." It's also important to note that under existing conditions many intersections are over capacity. Despite these scenarios showing a number of "green" or improved intersections, they do not improve well enough to alleviate any existing delay and queueing problems.



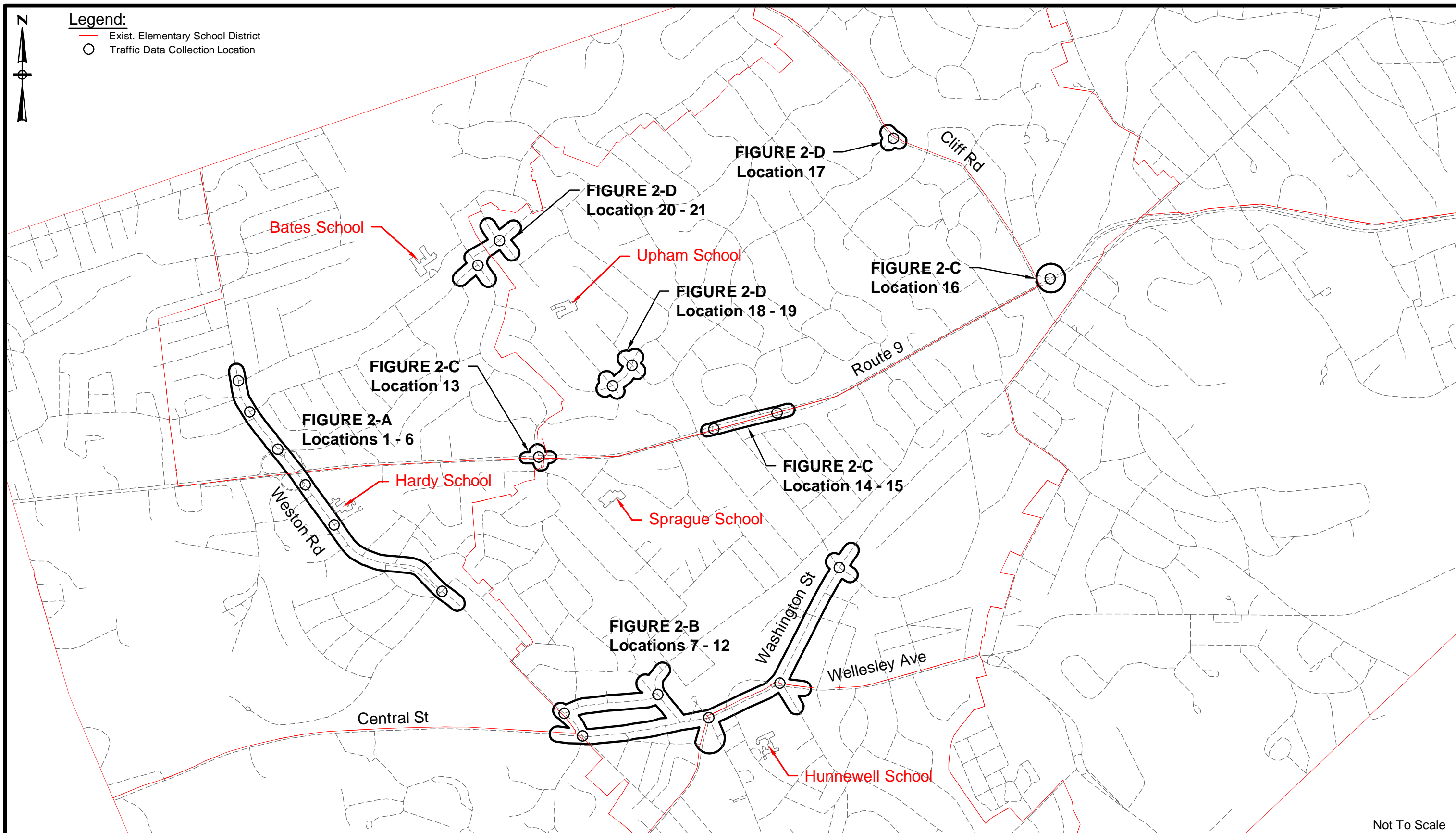
## APPENDIX

- Traffic Count Data
- Trip Generation/Distribution Maps
- Trip Distribution/Assignment Maps
- Traffic Analysis Results
- Weston Road Queue Observations



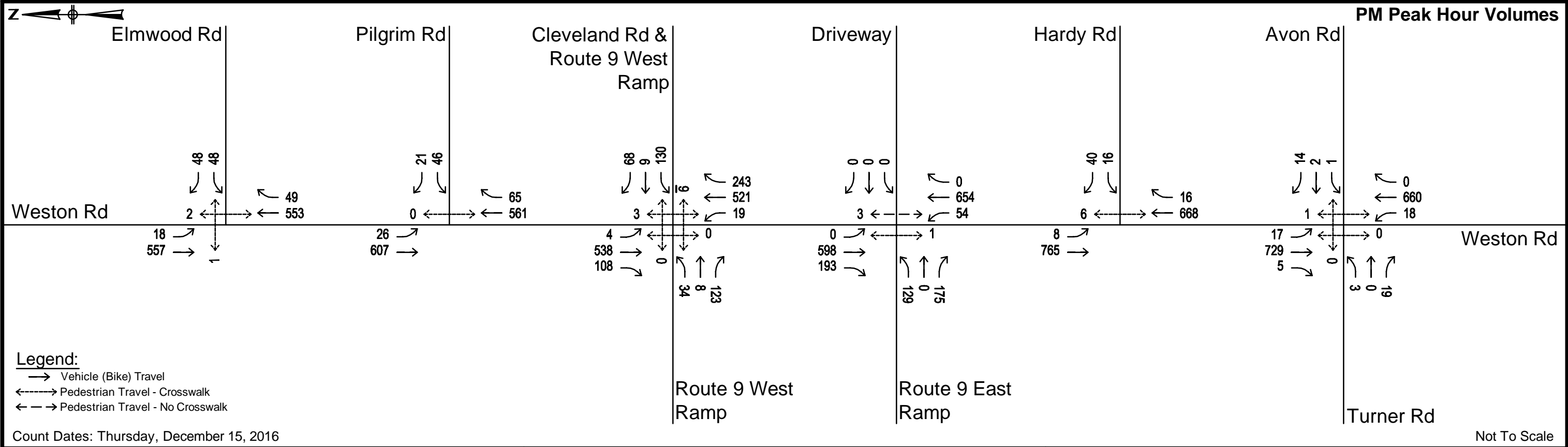
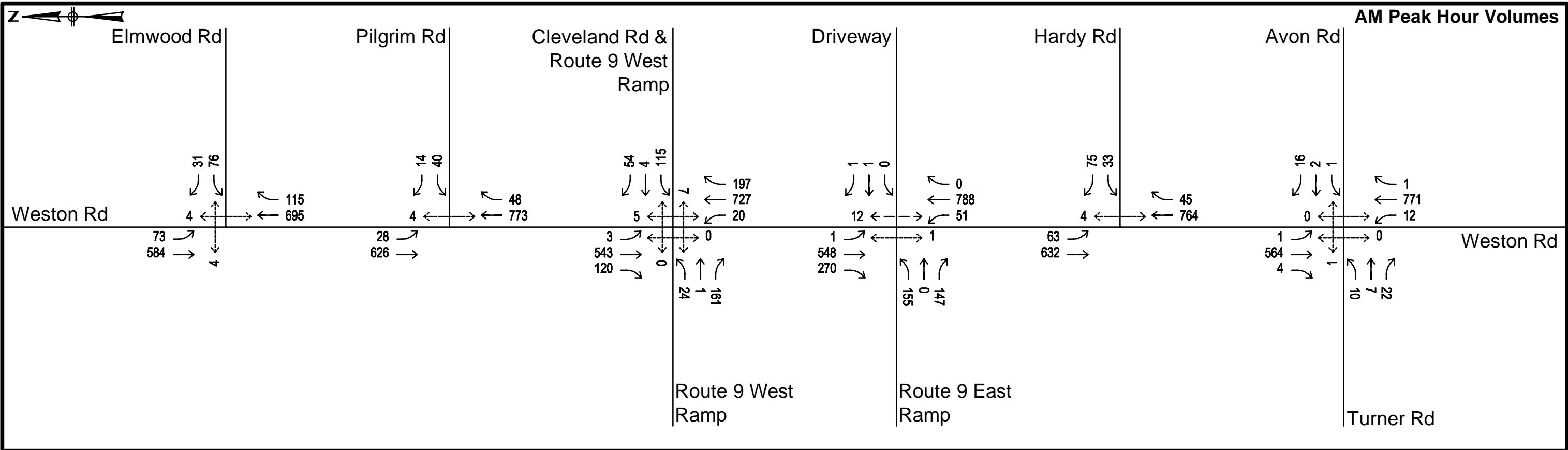
**Legend:**

- Exist. Elementary School District
- Traffic Data Collection Location



**High Level Traffic Evaluation  
Elementary School Redistricting**  
Wellesley, MA

**Figure 1**  
Traffic Data Collection Key Plan

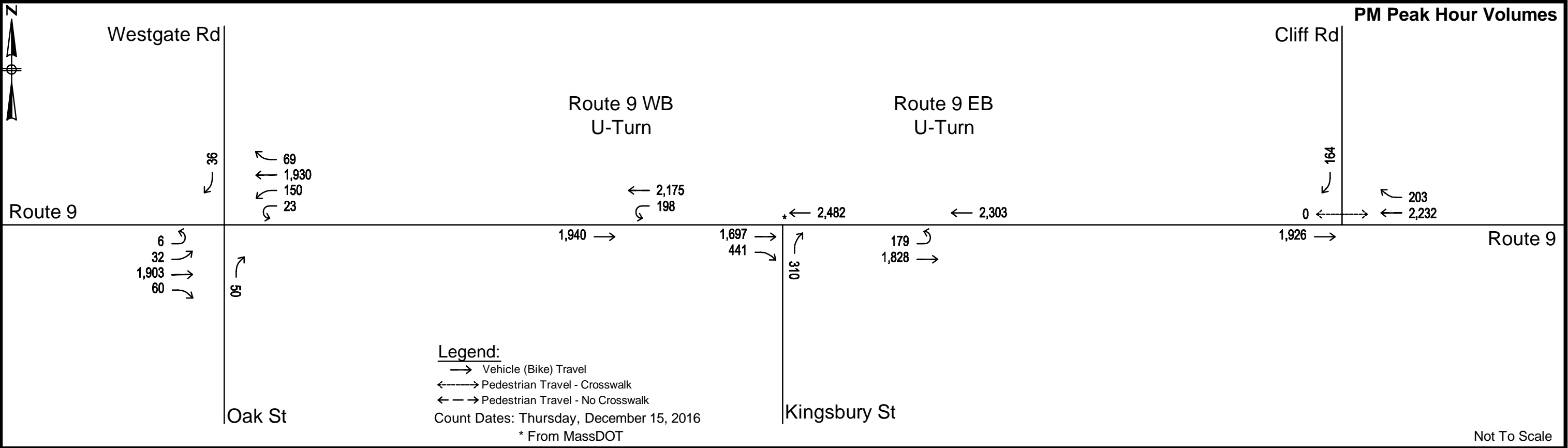
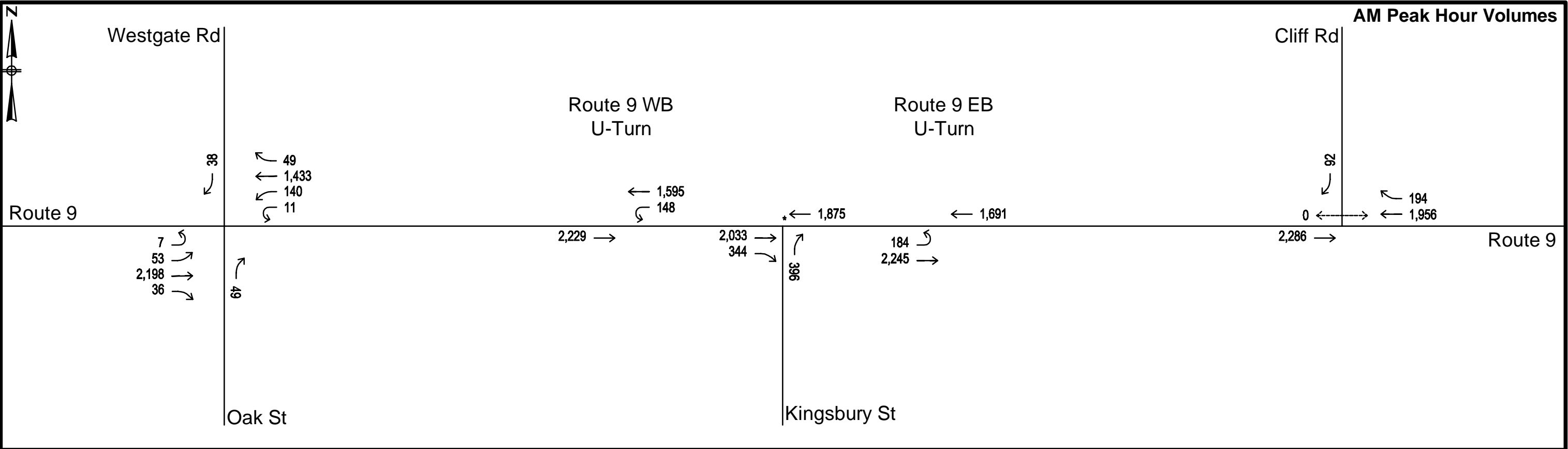


High Level Traffic Evaluation  
Elementary School Redistricting  
Wellesley, MA

Figure 2-A  
2016 Existing  
Weekday School Peak Hour Volumes



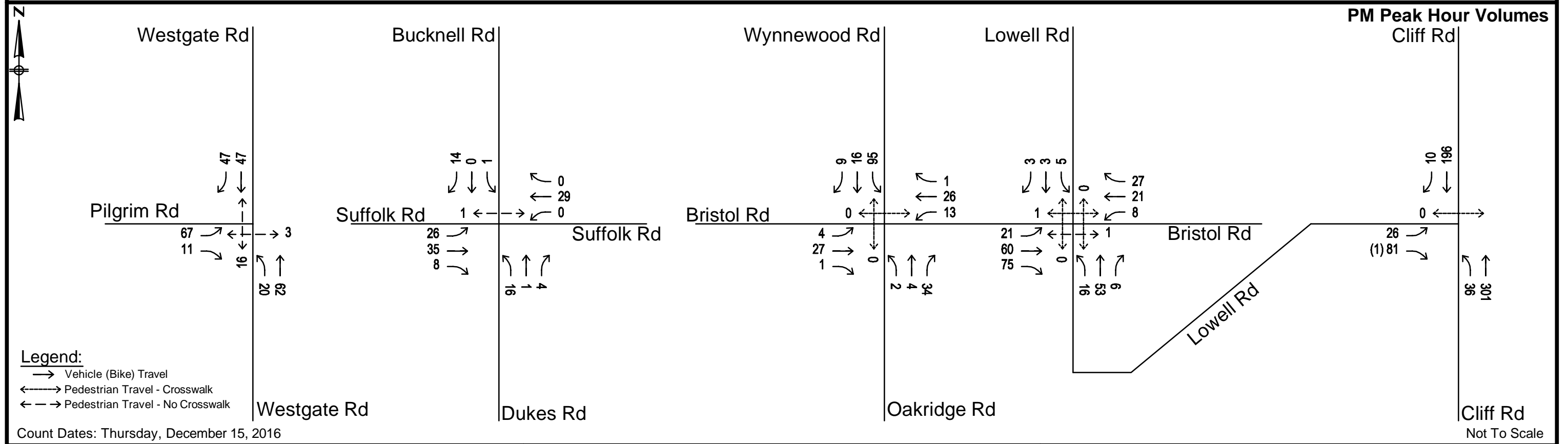
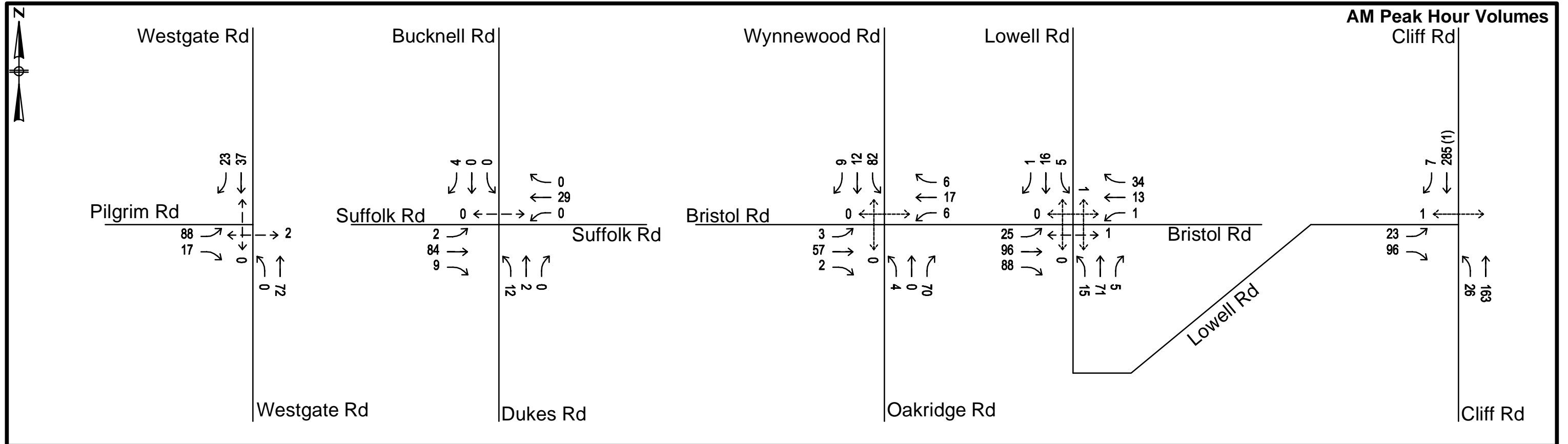
O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 2-C**  
2016 Existing  
Weekday School Peak Hour Volumes

O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm

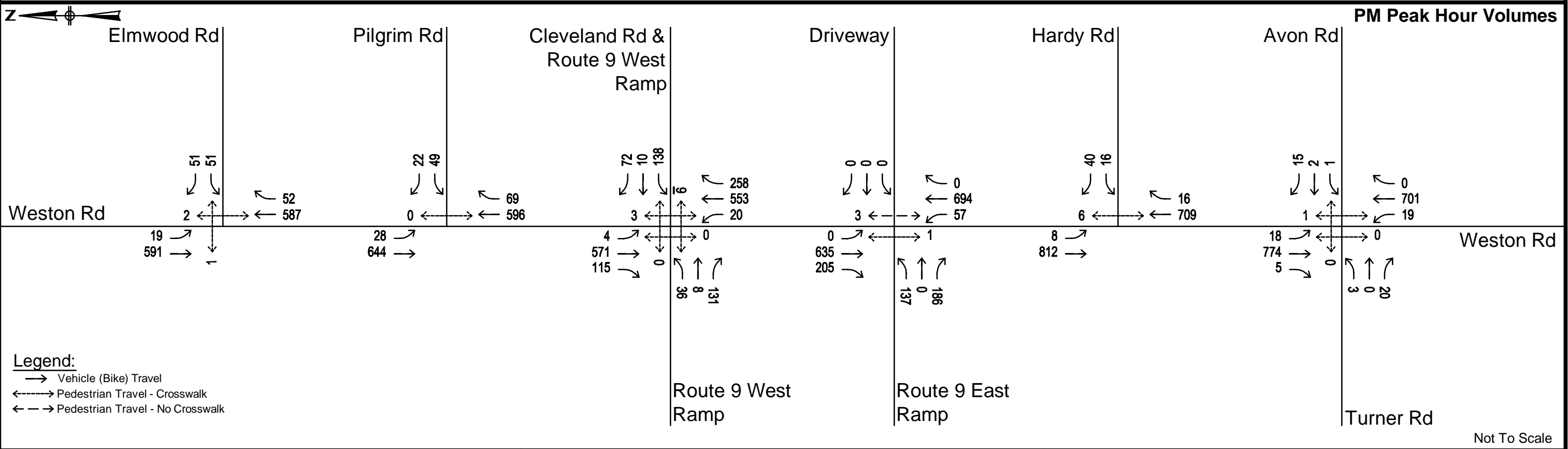
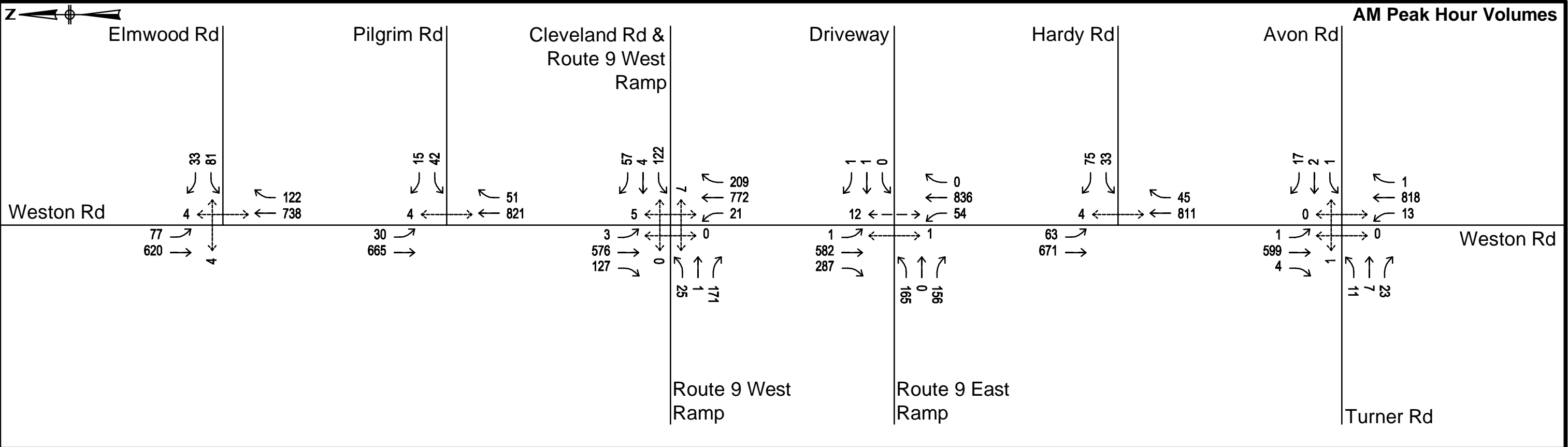


**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 2-D**  
2016 Existing  
Weekday School Peak Hour Volumes



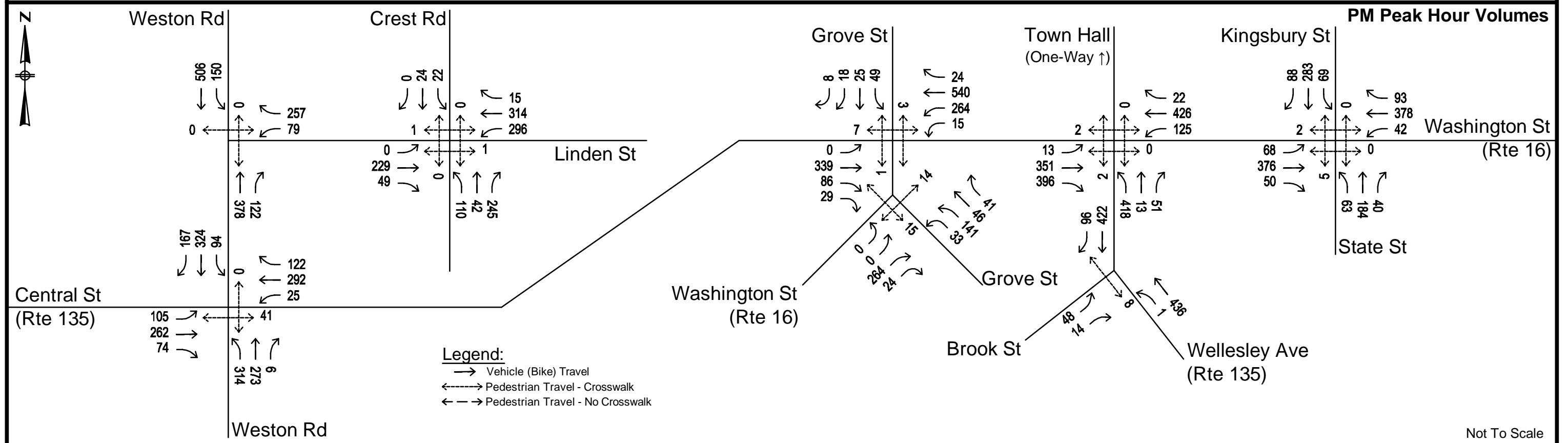
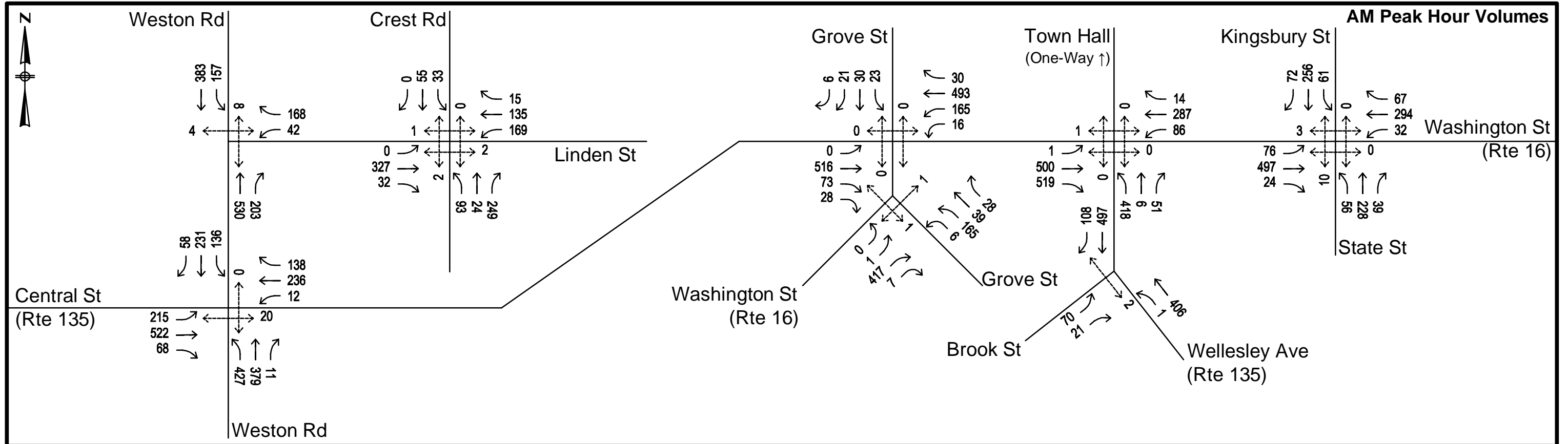
O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 3-A**  
2022 No-Build  
Weekday School Peak Hour Volumes

O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



Not To Scale

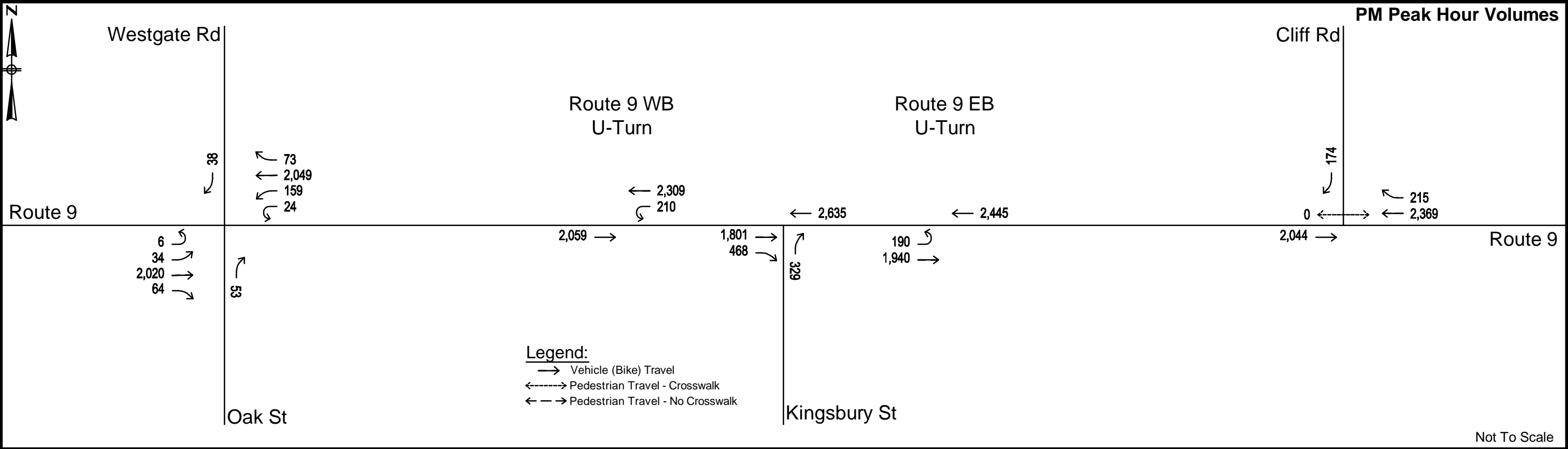
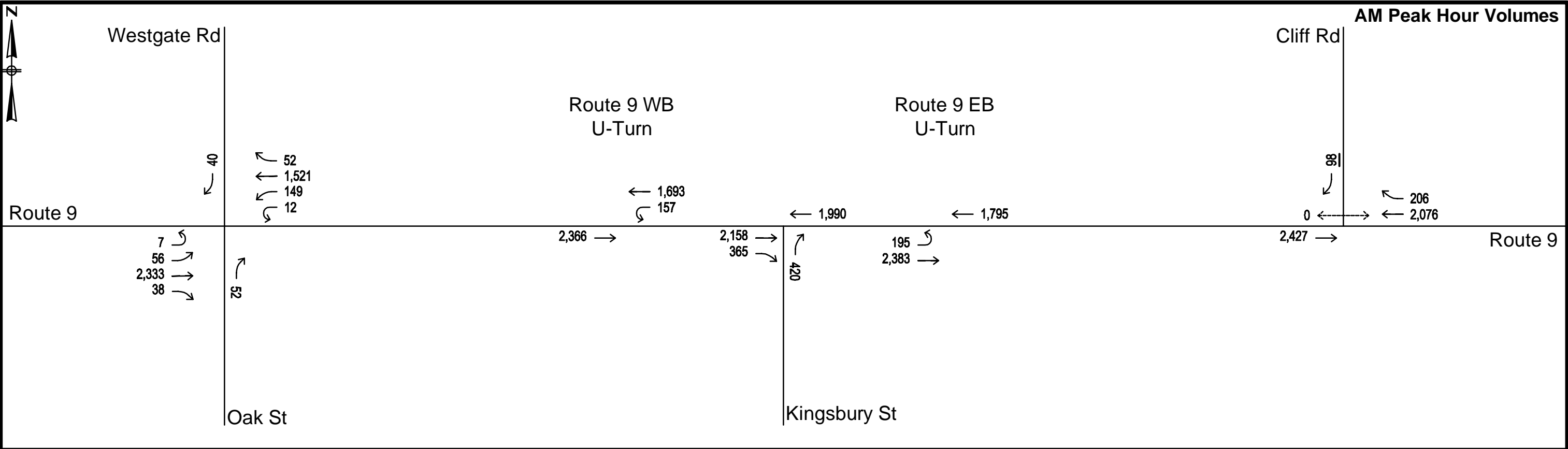


www.BETA-Inc.com

**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 3-B**  
2022 No-Build  
Weekday School Peak Hour Volumes

O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



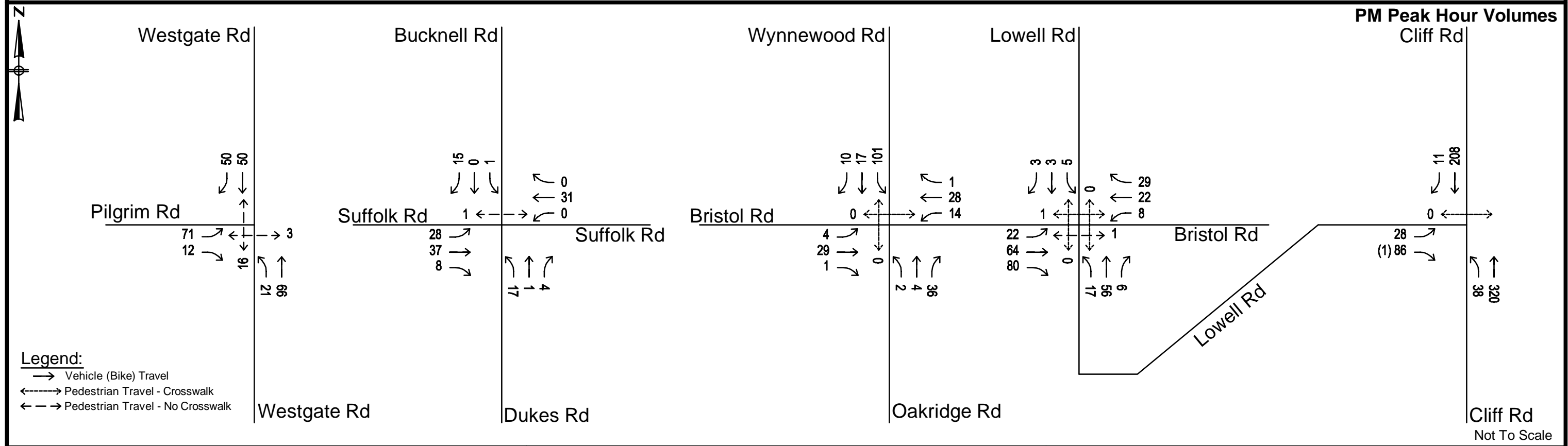
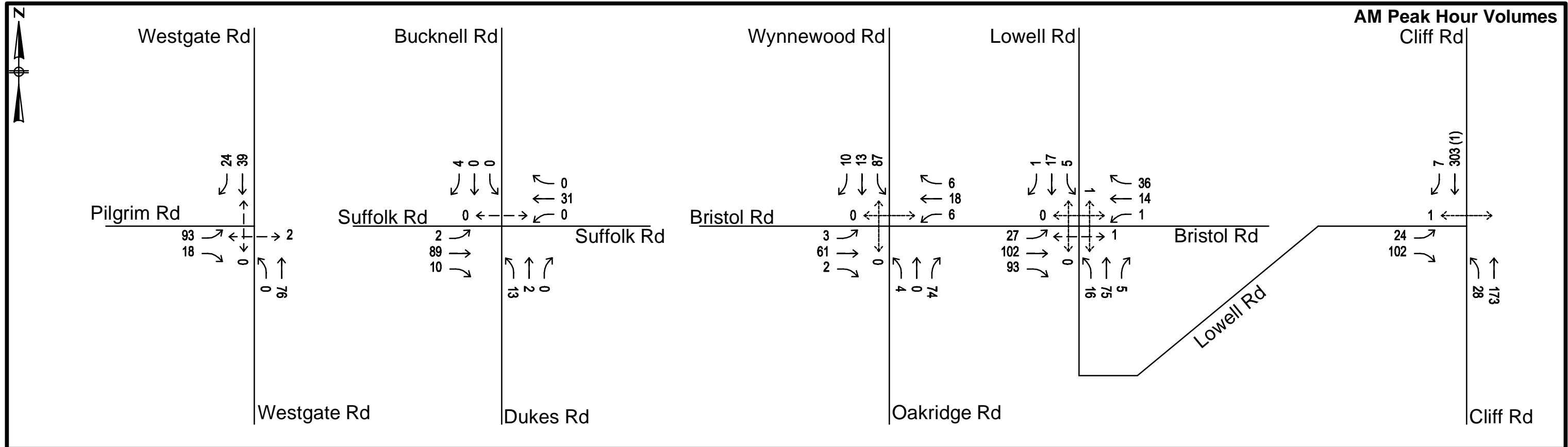
Not To Scale



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

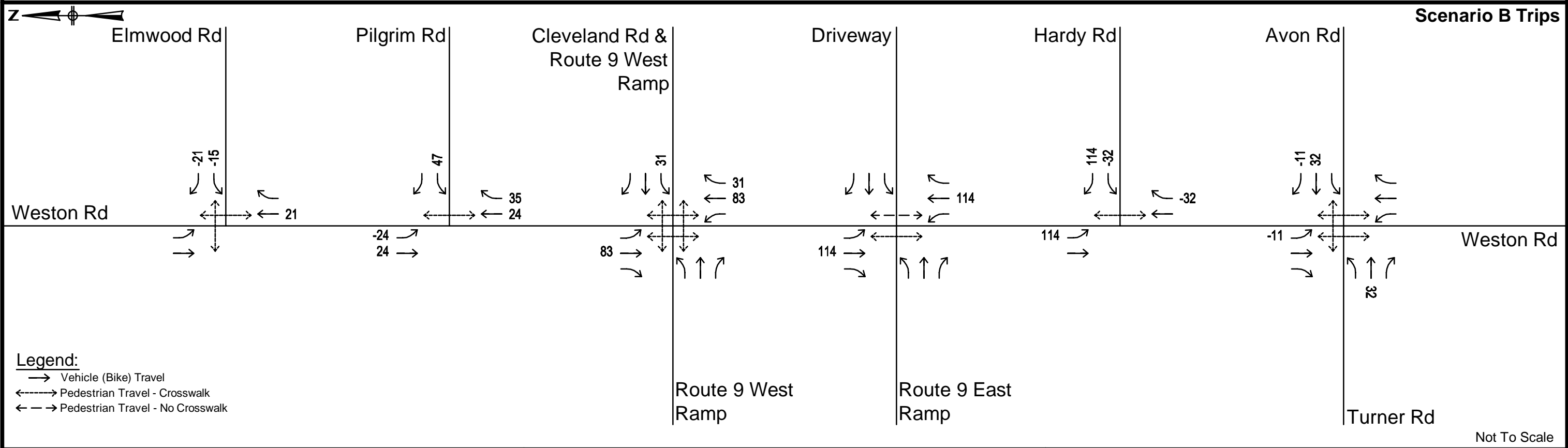
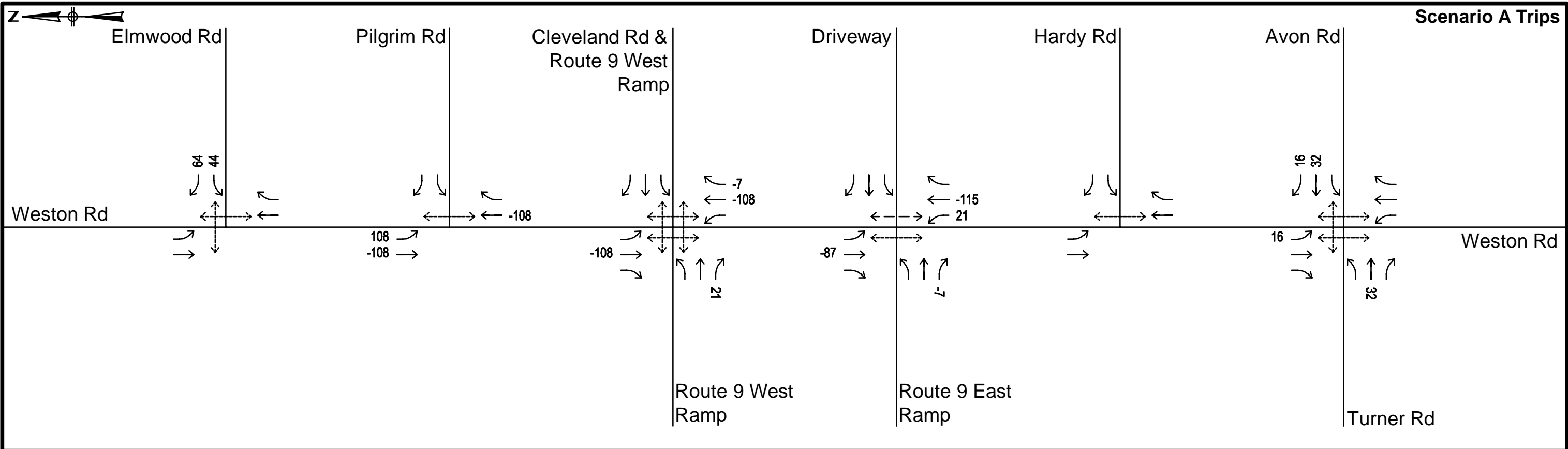
**Figure 3-C**  
2022 No-Build  
Weekday School Peak Hour Volumes

O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 3-D**  
2022 No-Build  
Weekday School Peak Hour Volumes



Not To Scale

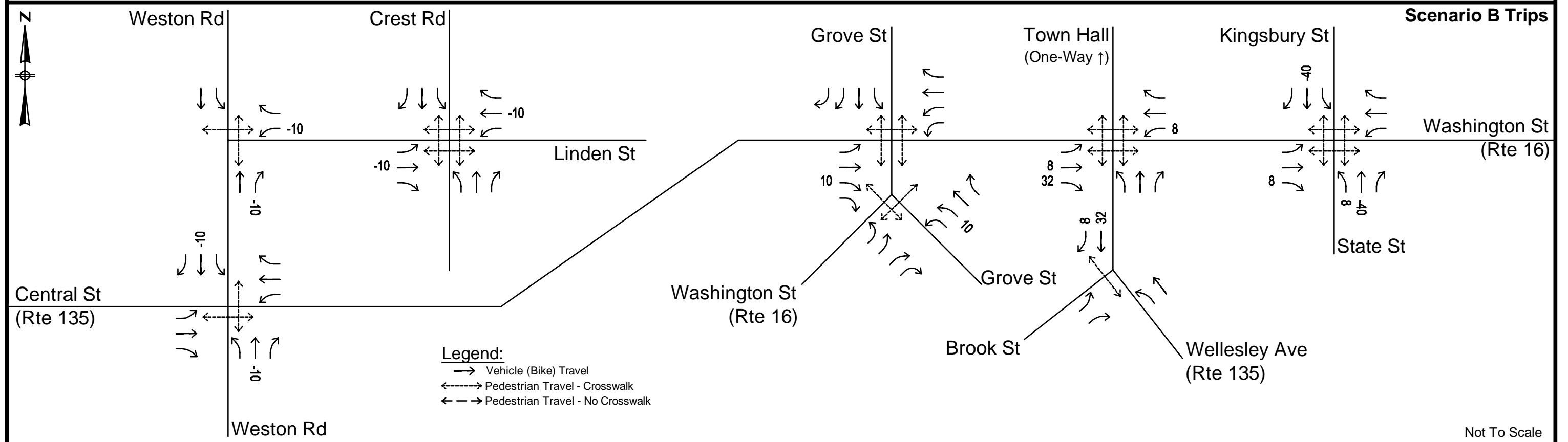
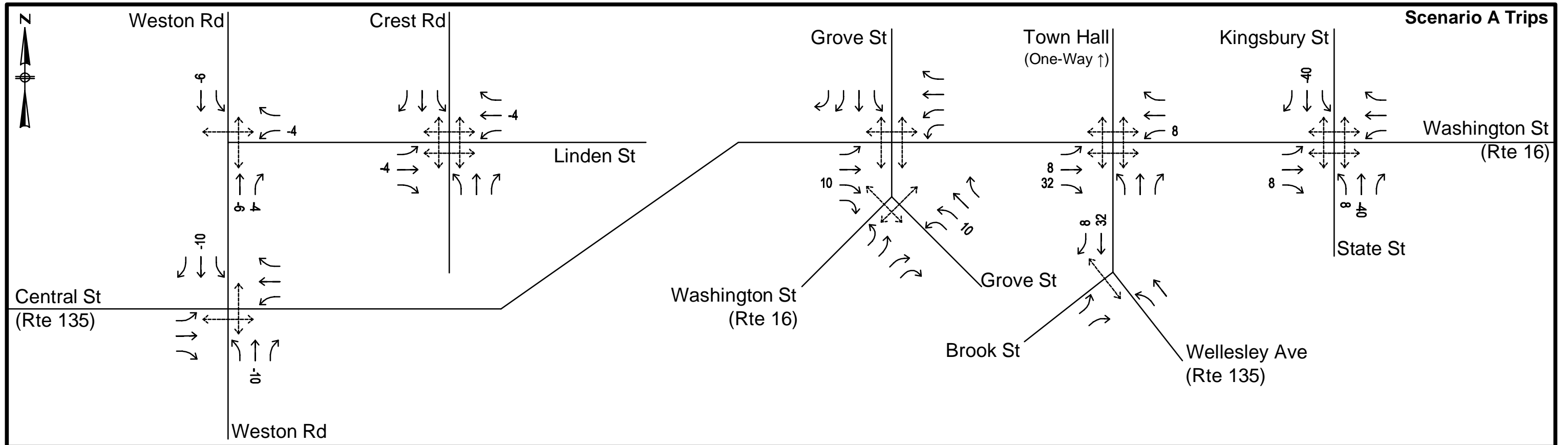


# **High Level Traffic Evaluation** **Elementary School Redistricting** Wellesley, MA

**Figure 4-A**  
Scenario A and Scenario B  
Trip Assignment

O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm

O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



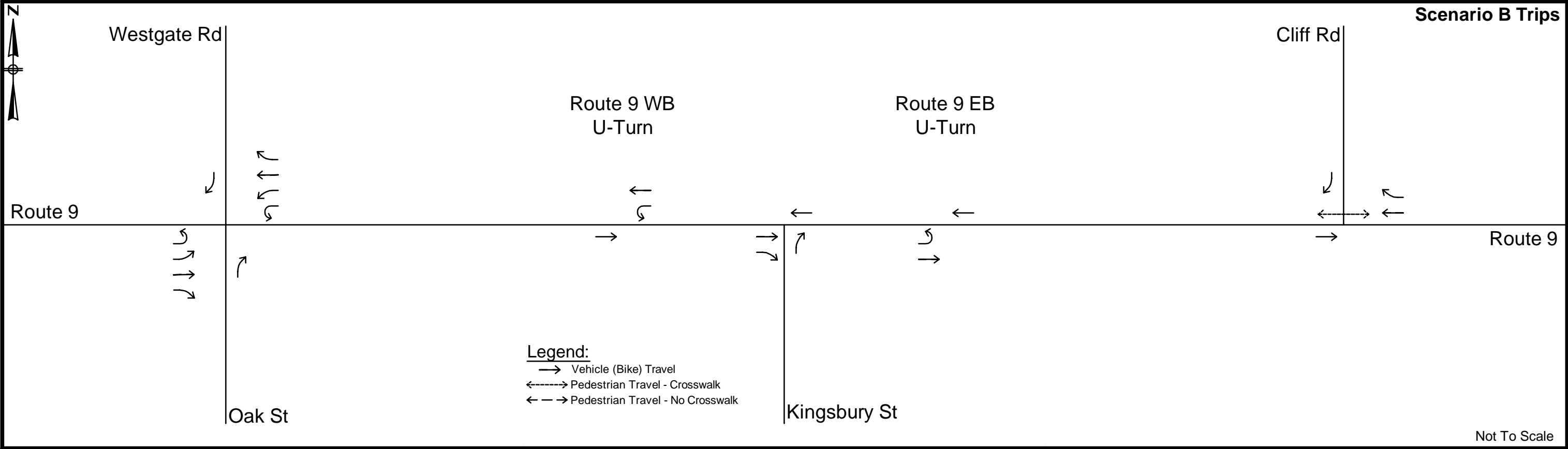
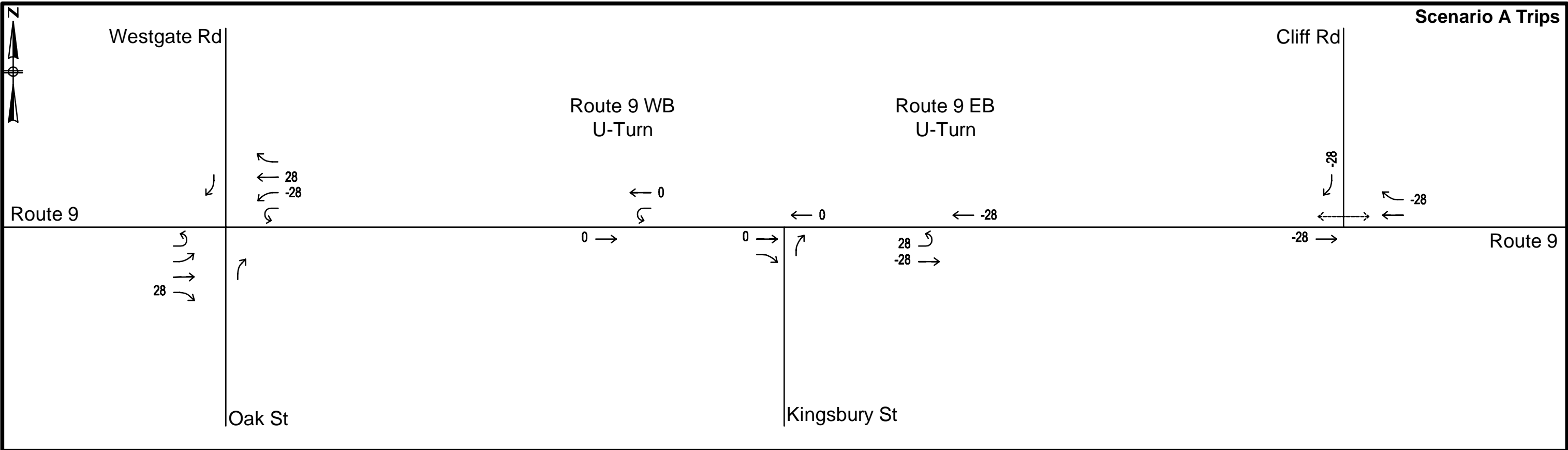
Not To Scale



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 4-B**  
Scenario A and Scenario B  
Trip Assignment





**Legend:**  
→ Vehicle (Bike) Travel  
←-----→ Pedestrian Travel - Crosswalk  
← -- → Pedestrian Travel - No Crosswalk

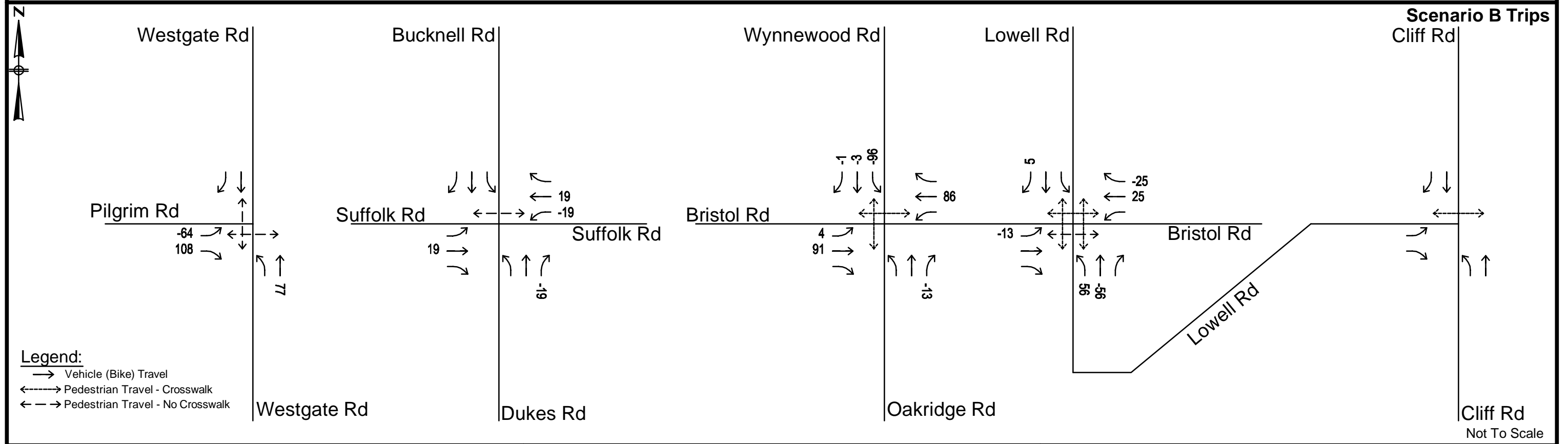
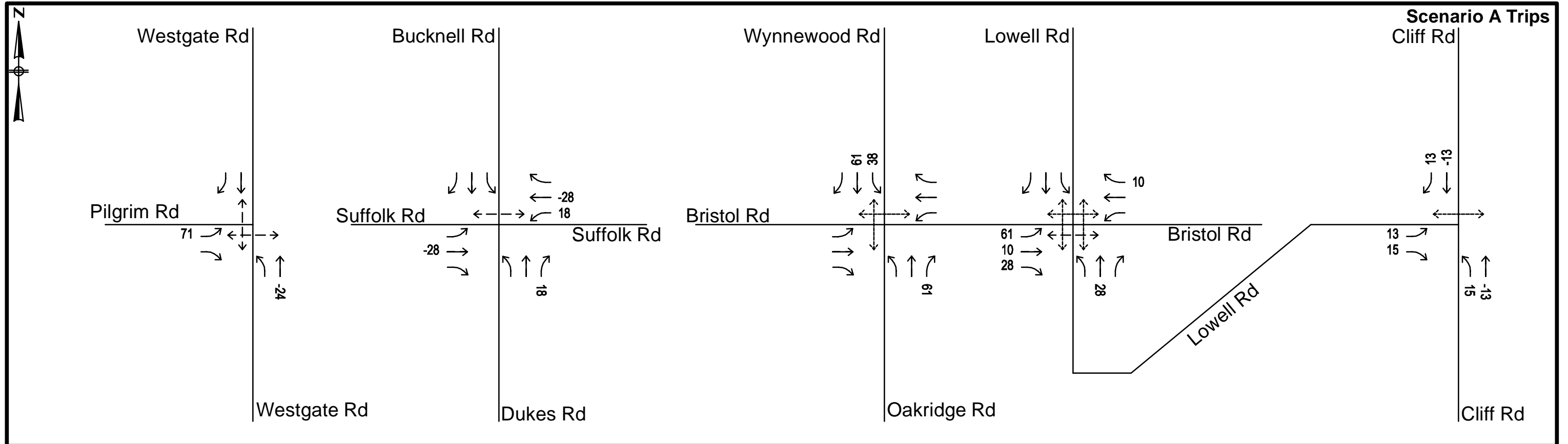
Not To Scale



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

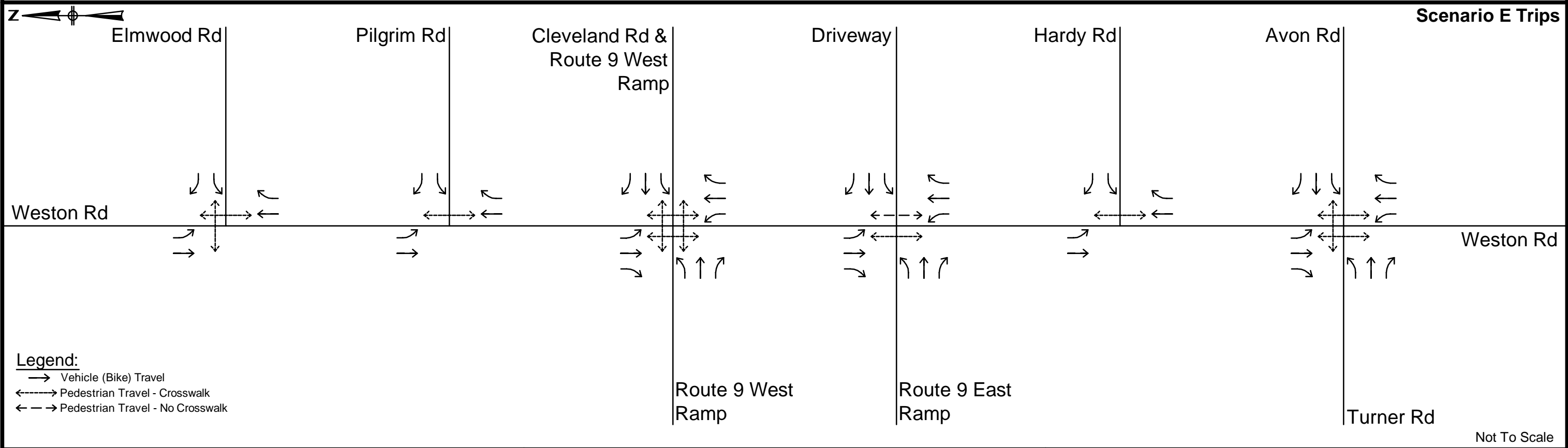
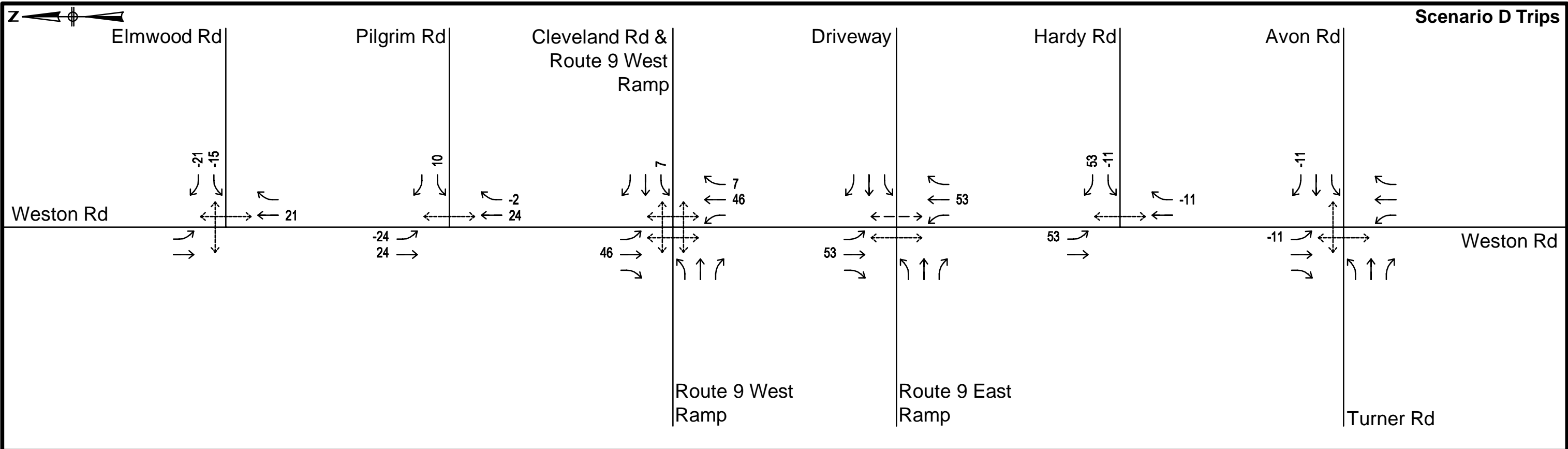
**Figure 4-C**  
Scenario A and Scenario B  
Trip Assignment

O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



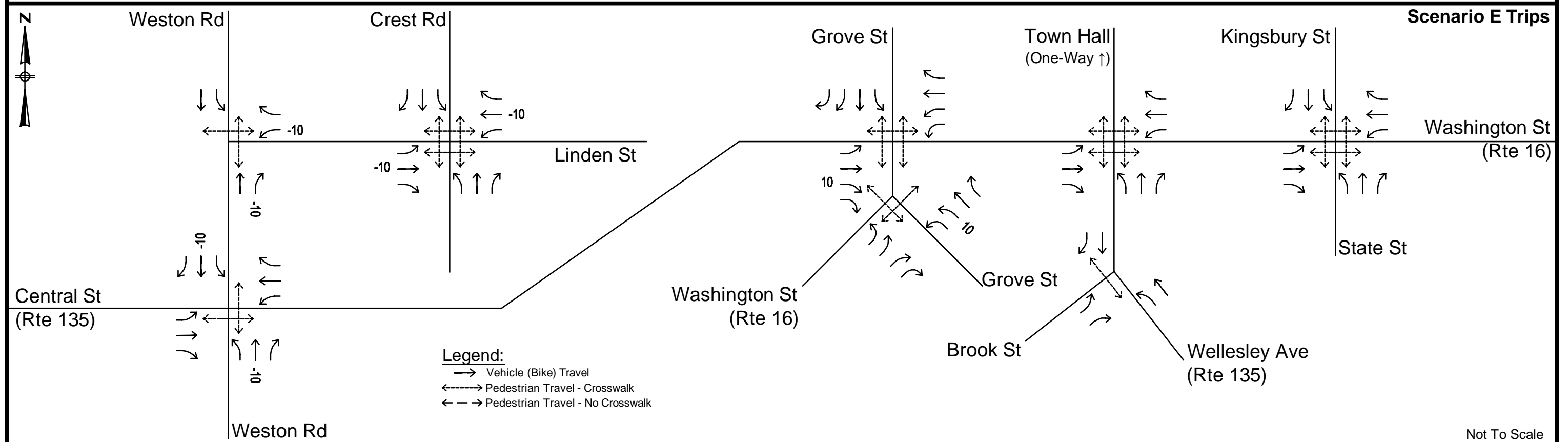
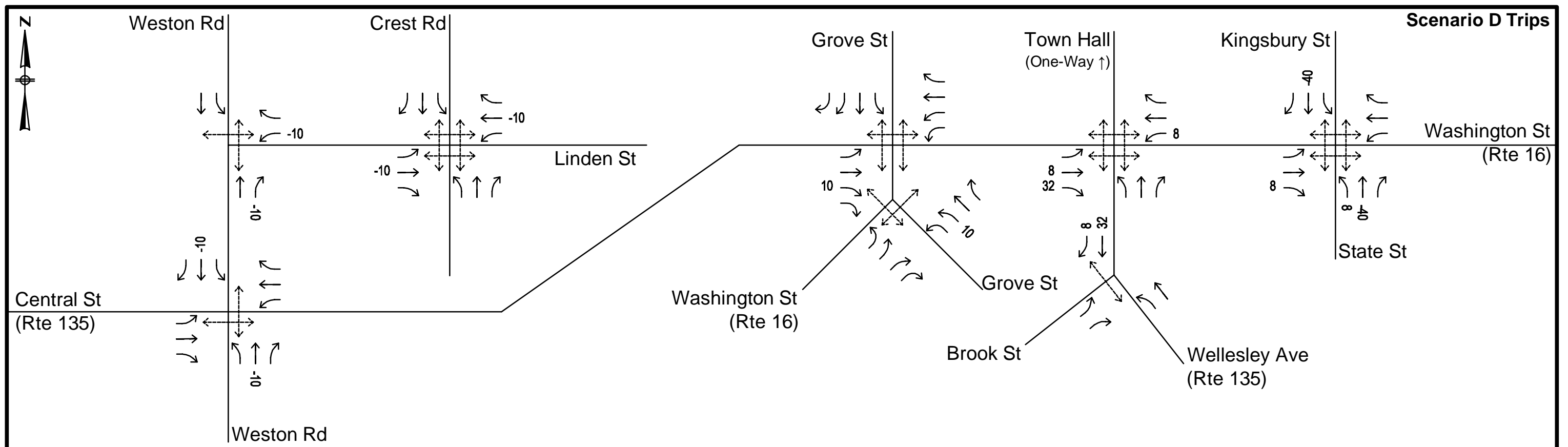
**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 4-D**  
Scenario A and Scenario B  
Trip Assignment



## High Level Traffic Evaluation Elementary School Redistricting Wellesley, MA

**Figure 5-A**  
Scenario D and Scenario E  
Trip Assignment



## High Level Traffic Evaluation

### Elementary School Redistricting

Wellesley, MA

Wellesley, MA

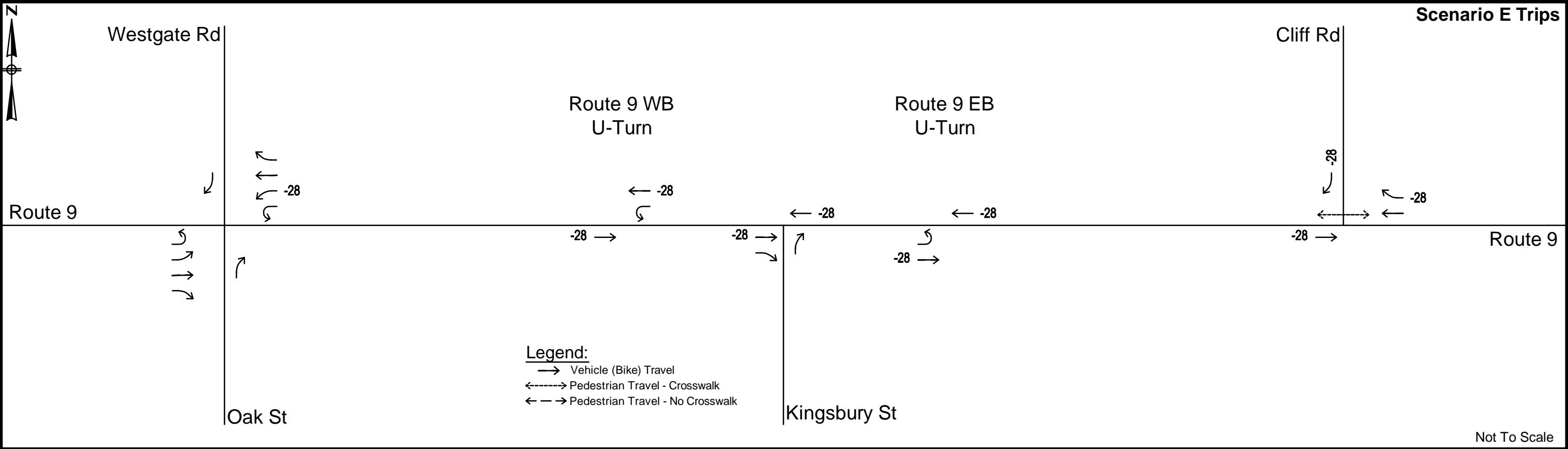
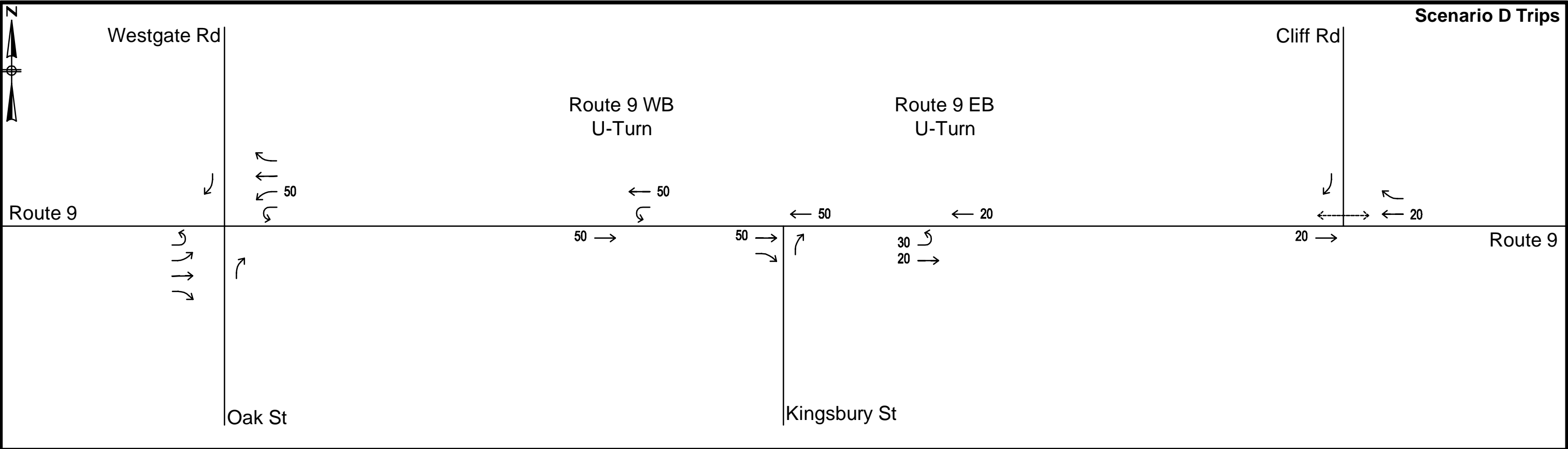
### Figure 5-B

### Scenario D and Scenario E Trip Assignment

## Trip Assignment

Not To Scale

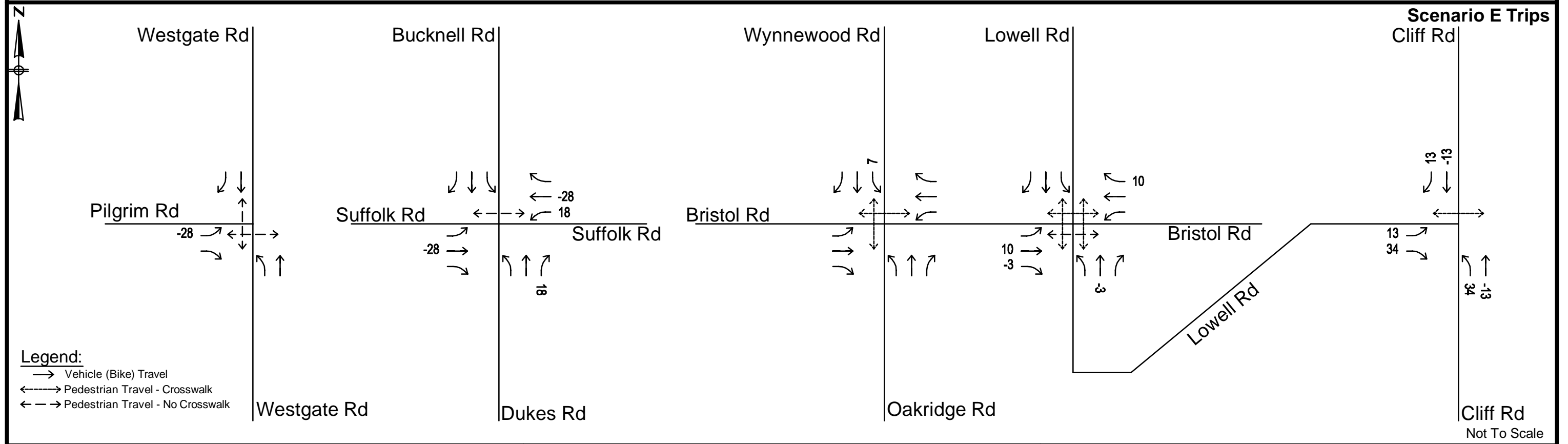
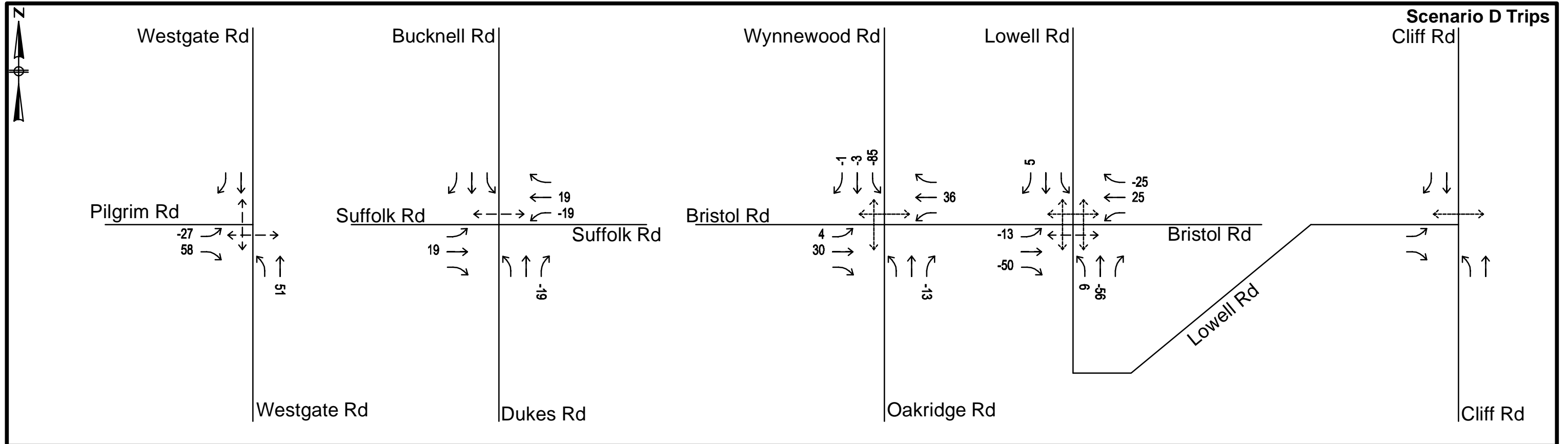
O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 5-C**  
Scenario D and Scenario E  
Trip Assignment

O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm

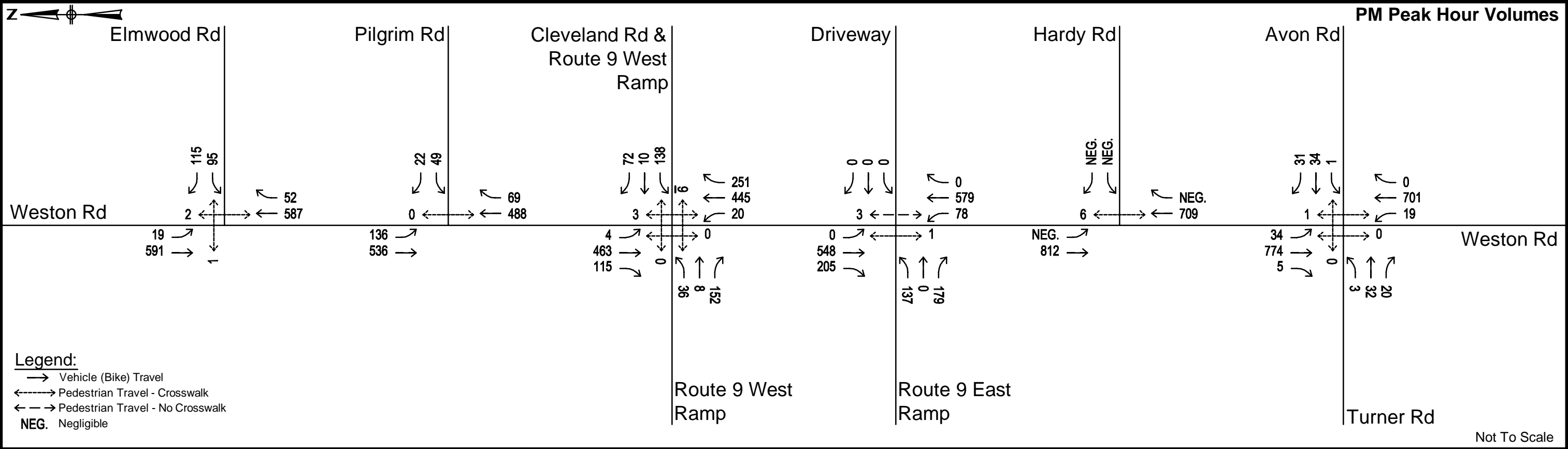
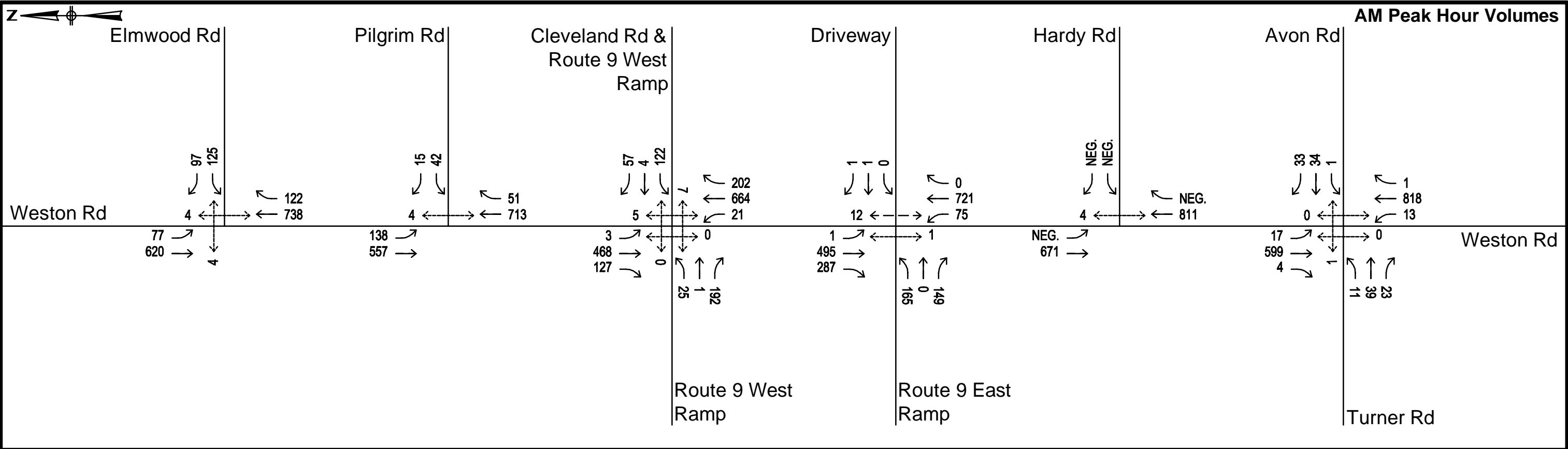


**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 5-D**  
Scenario D and Scenario E  
Trip Assignment

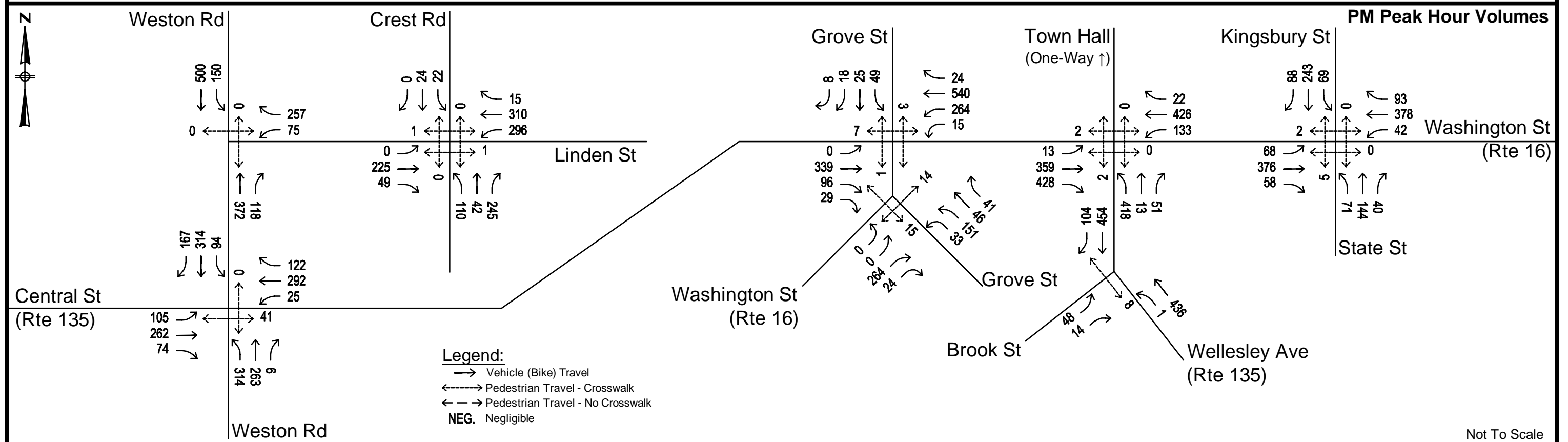
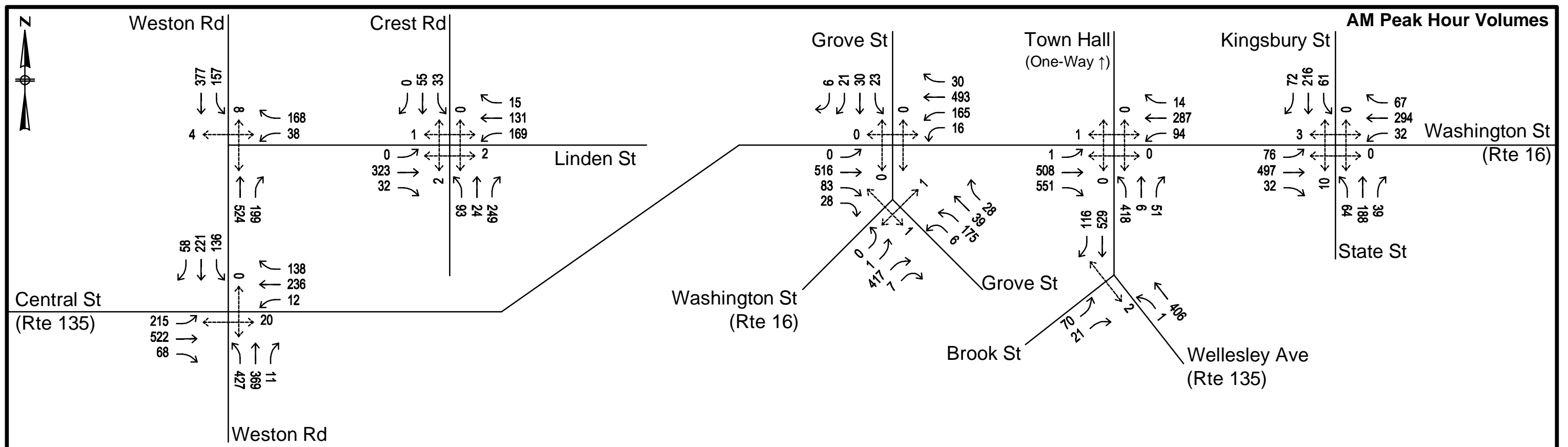


O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 6-A**  
2022 Build - Scenario A  
Weekday School Peak Hour Volumes



Not To Scale



[www.BETA-Inc.com](http://www.BETA-Inc.com)

## High Level Traffic Evaluation

### Elementary School Redistricting

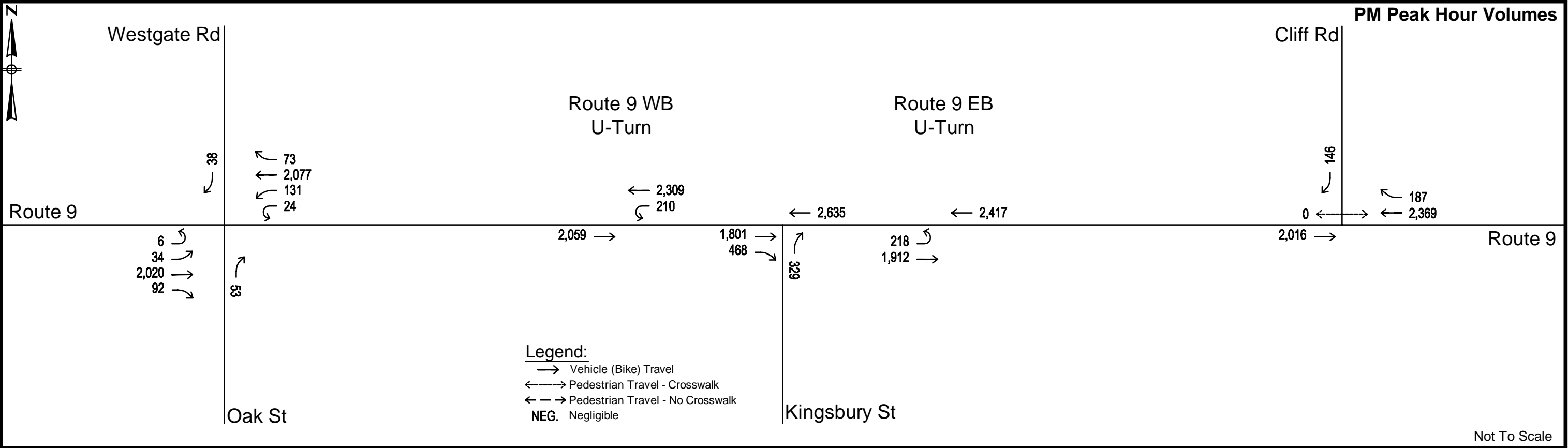
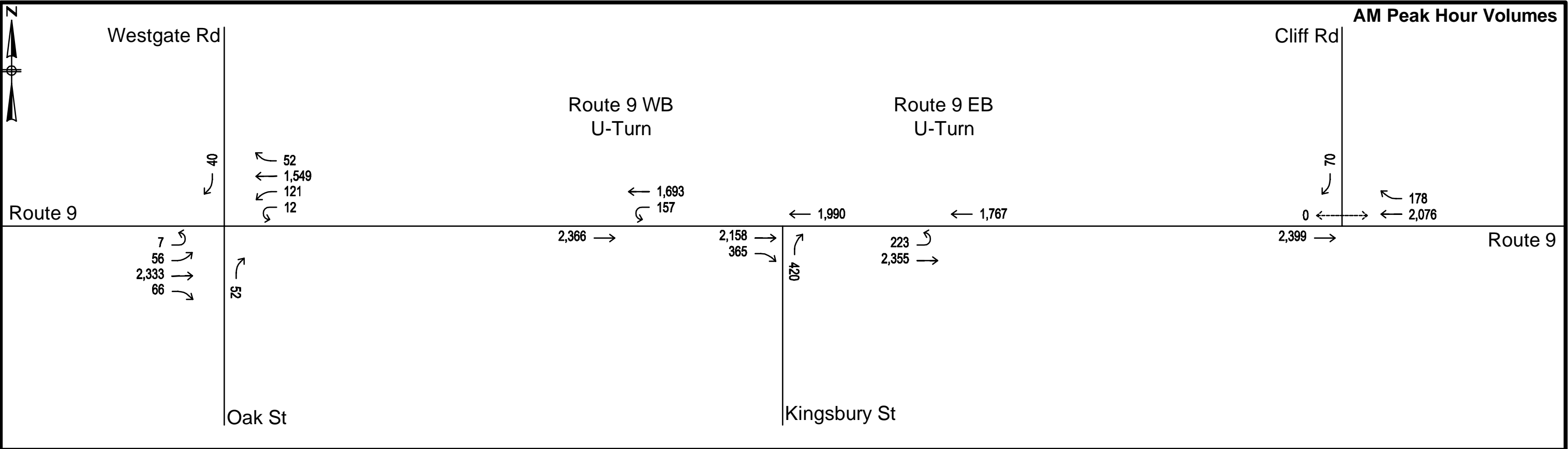
## Elementary School Redistricting

Wellesley, MA

### Figure 6-B

2022 Build - Scenario A  
Weekday School Peak Hour Volumes

O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



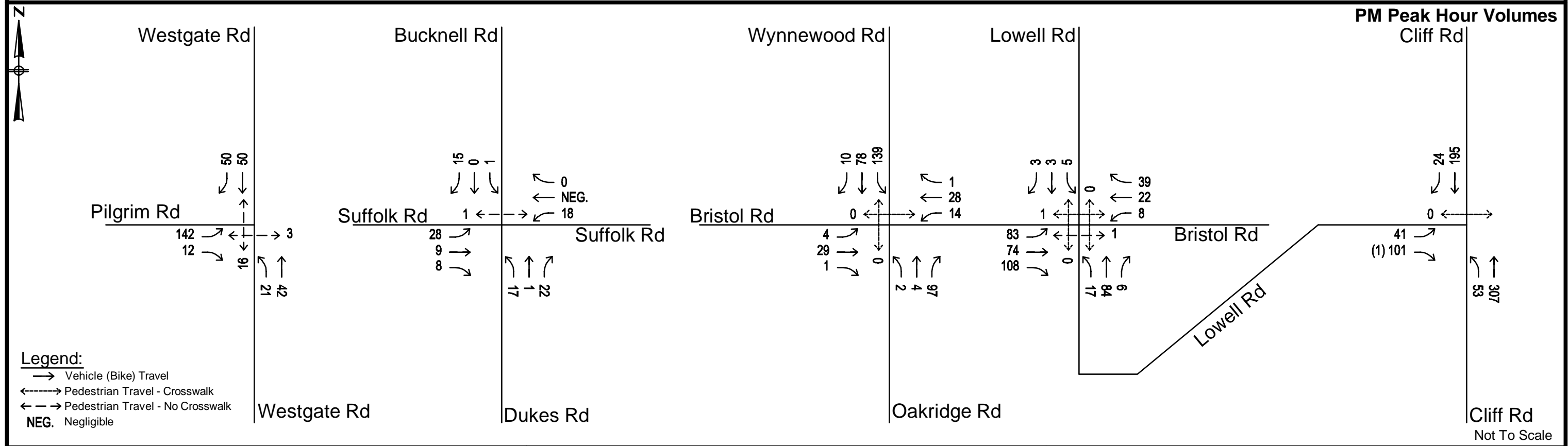
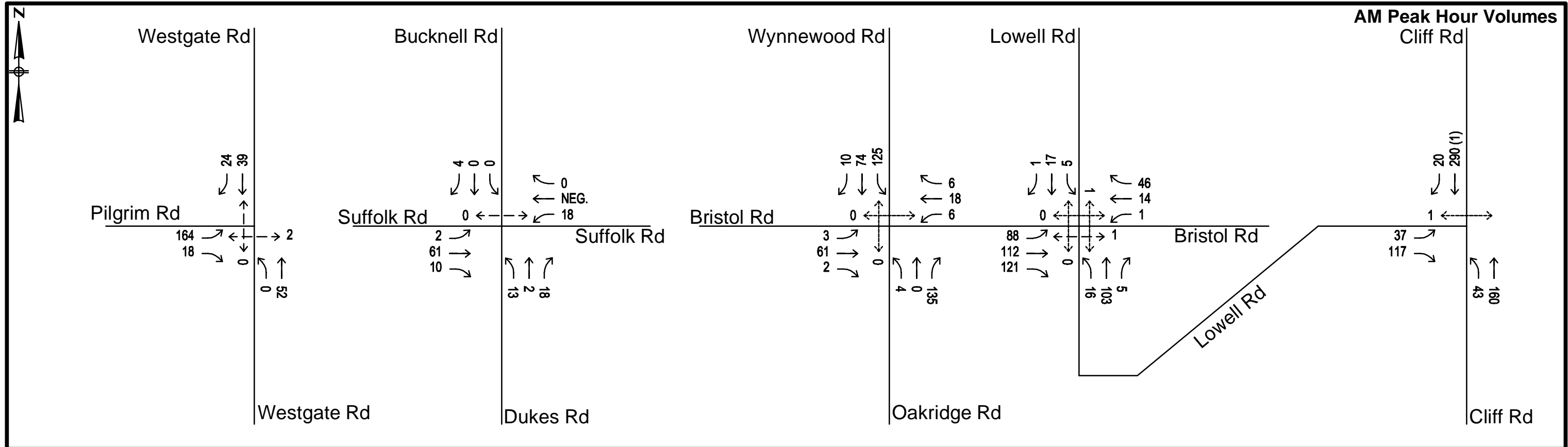
Not To Scale



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 6-C**  
2022 Build - Scenario A  
Weekday School Peak Hour Volumes

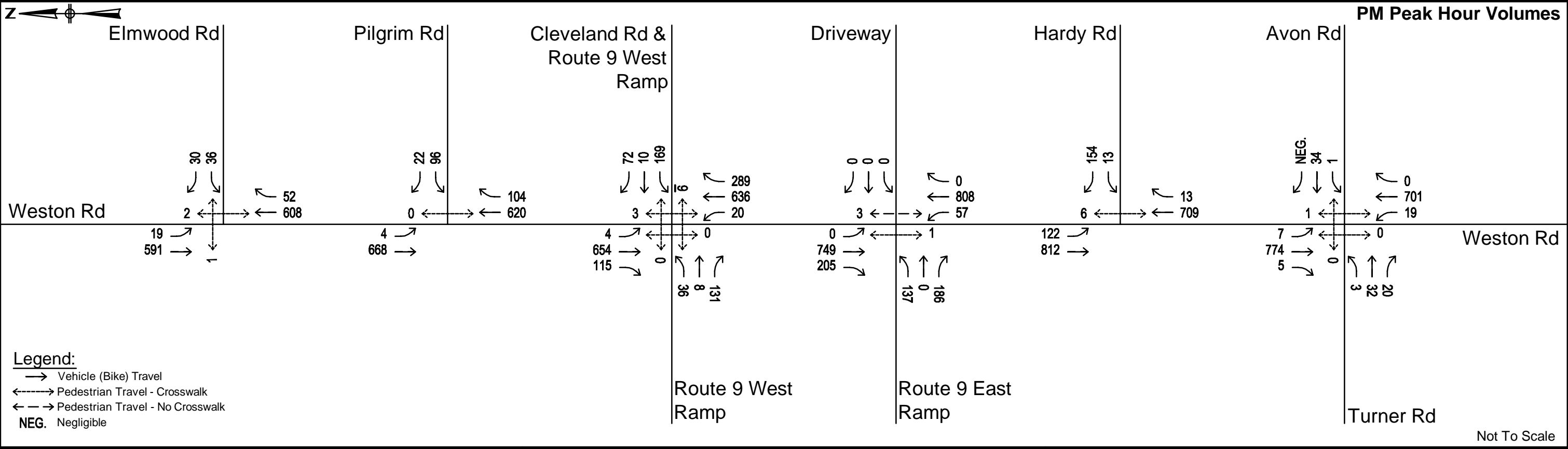
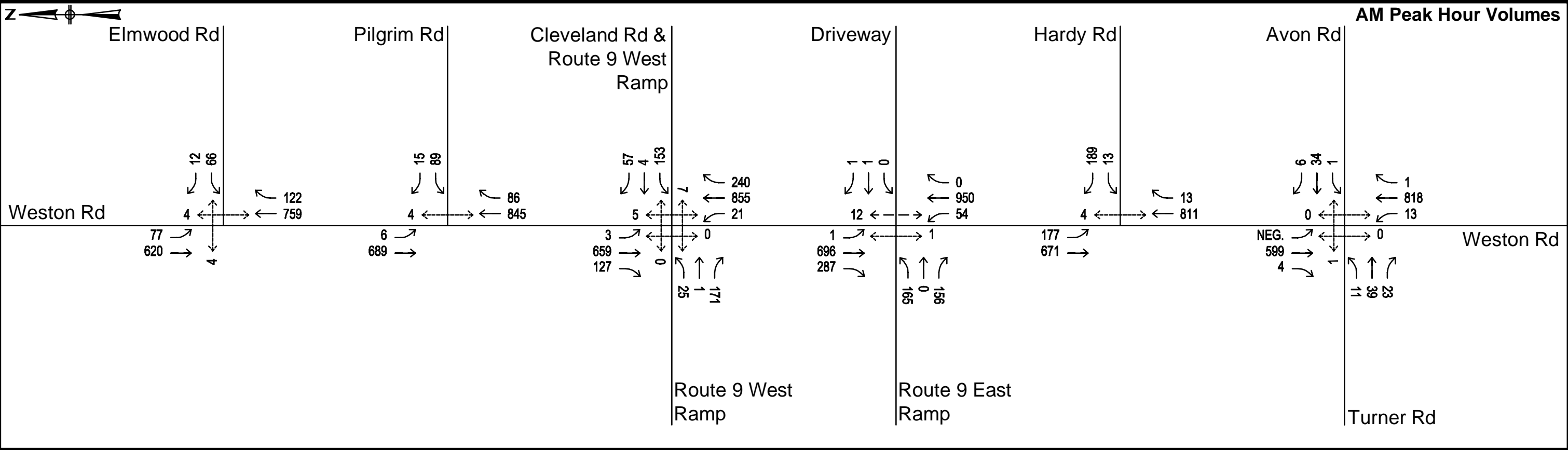
O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 6-D**  
2022 Build - Scenario A  
Weekday School Peak Hour Volumes

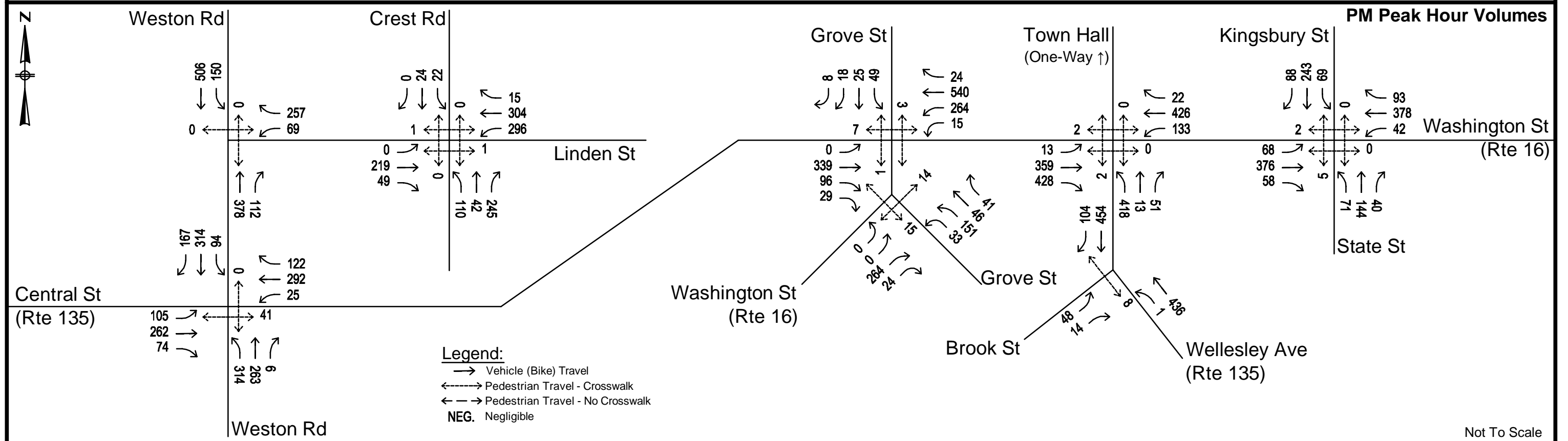
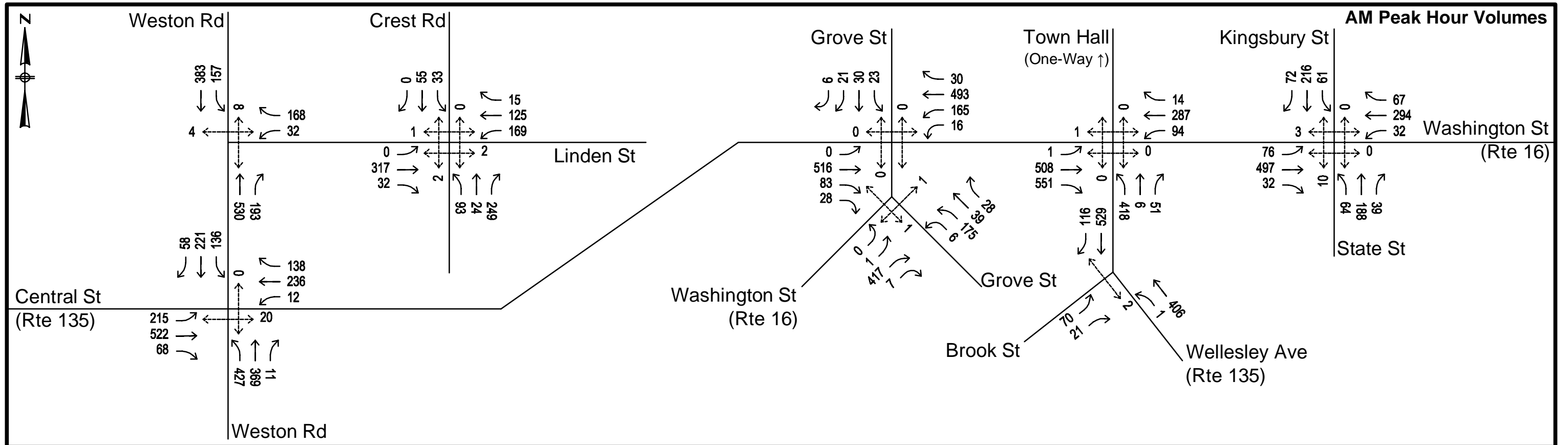
O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 7-A**  
2022 Build - Scenario B  
Weekday School Peak Hour Volumes

O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm

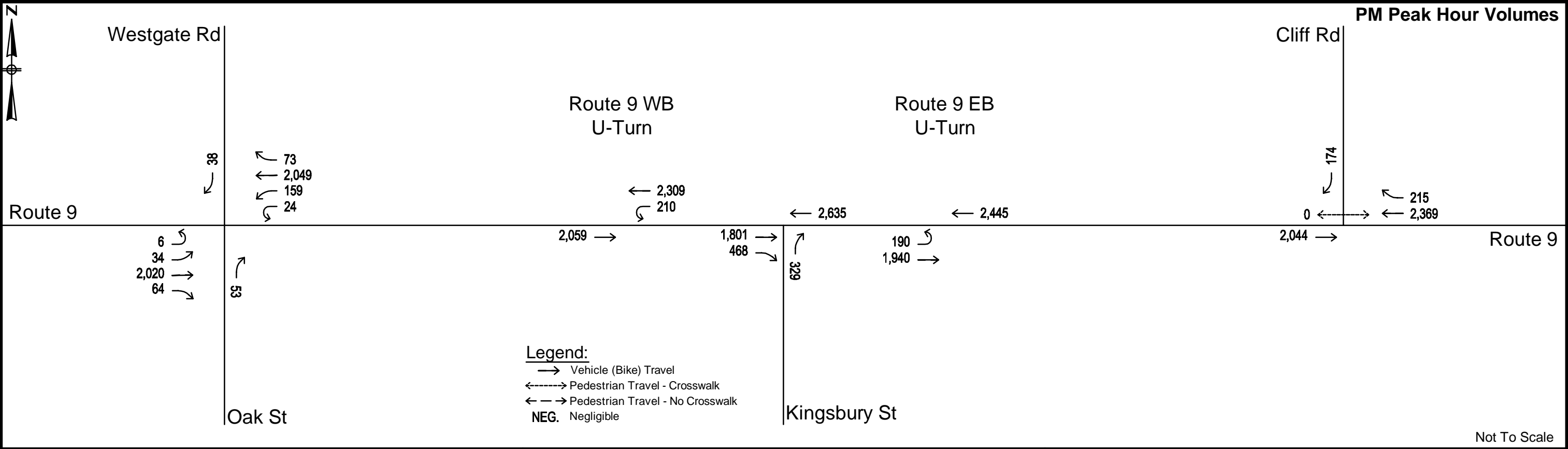
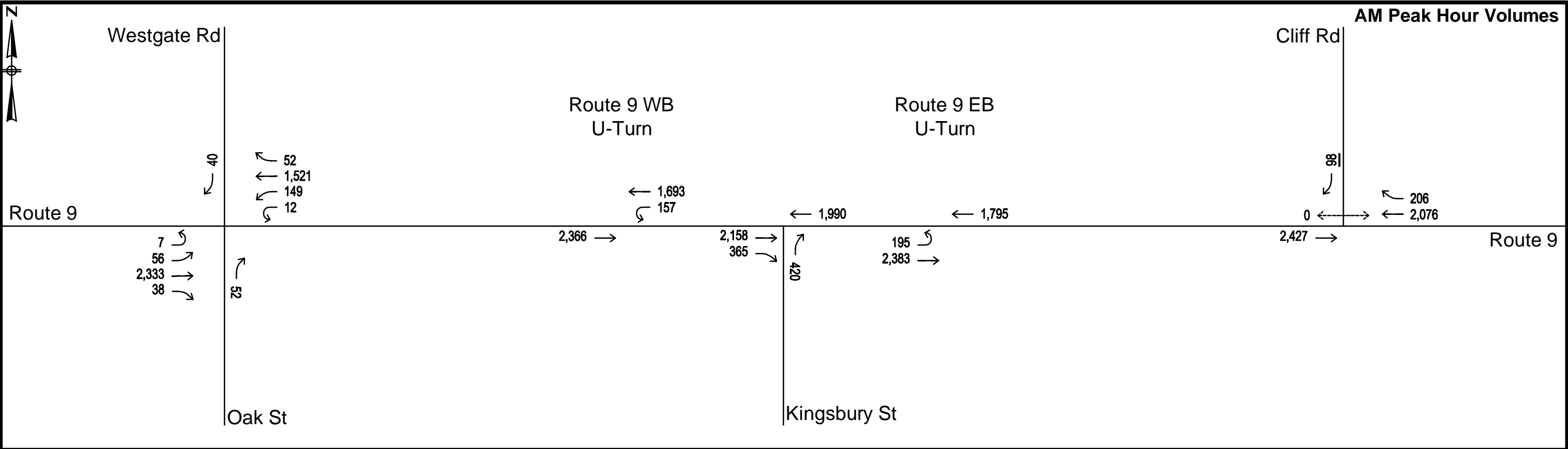


**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 7-B**  
2022 Build - Scenario B  
Weekday School Peak Hour Volumes



O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



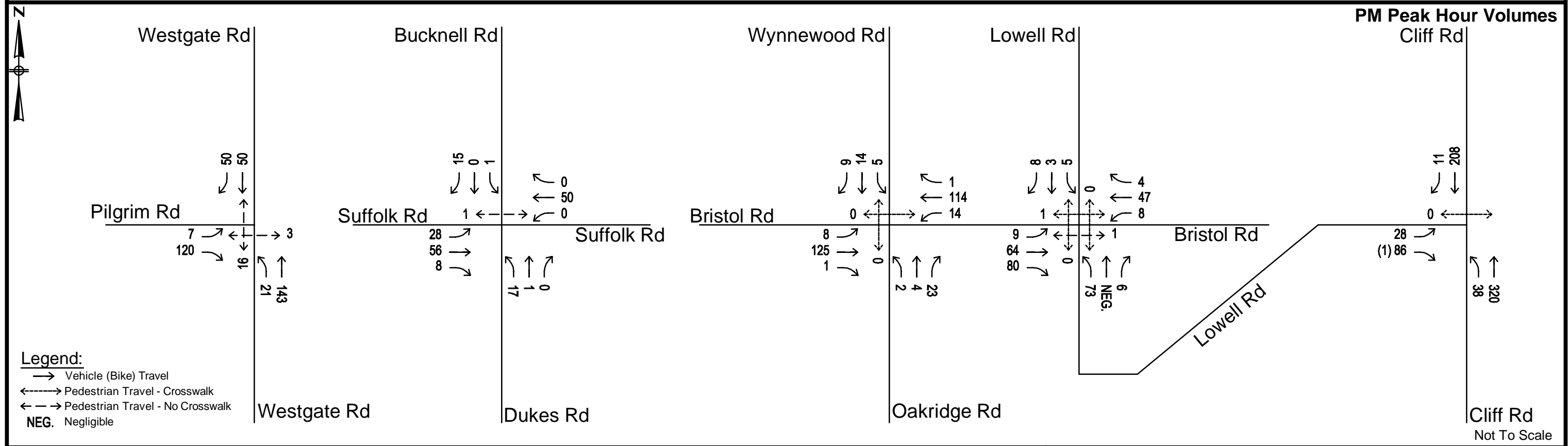
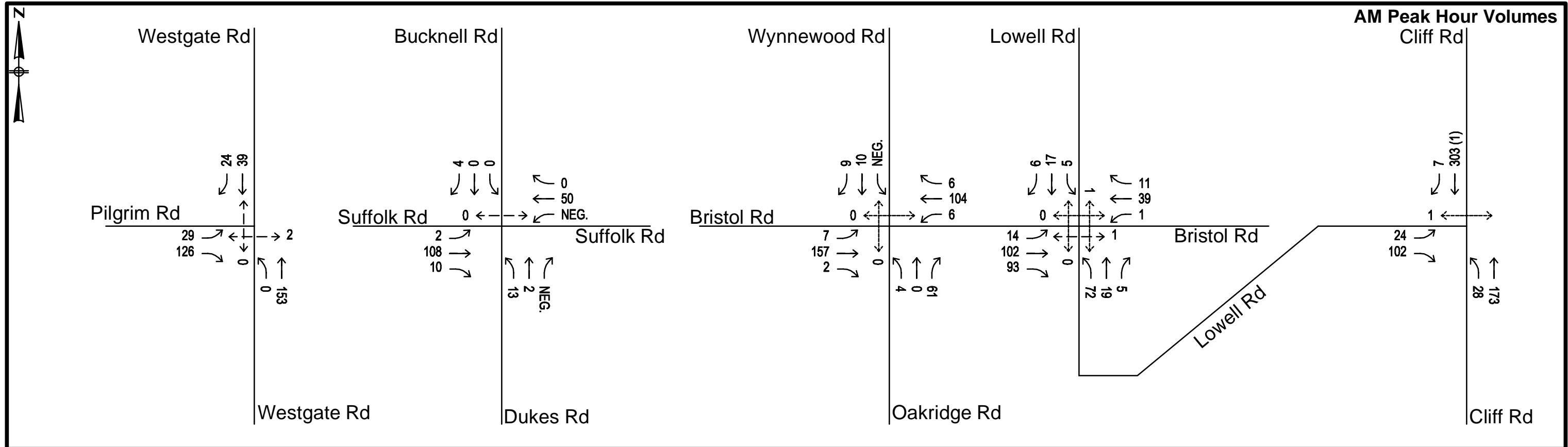
Not To Scale



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 7-C**  
2022 Build - Scenario B  
Weekday School Peak Hour Volumes

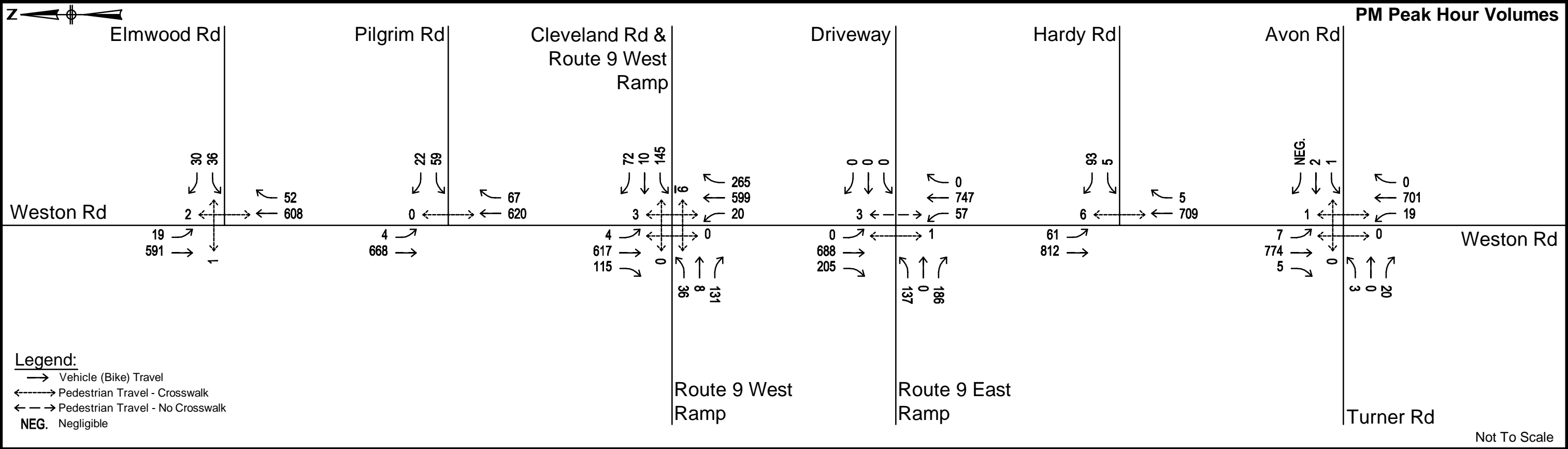
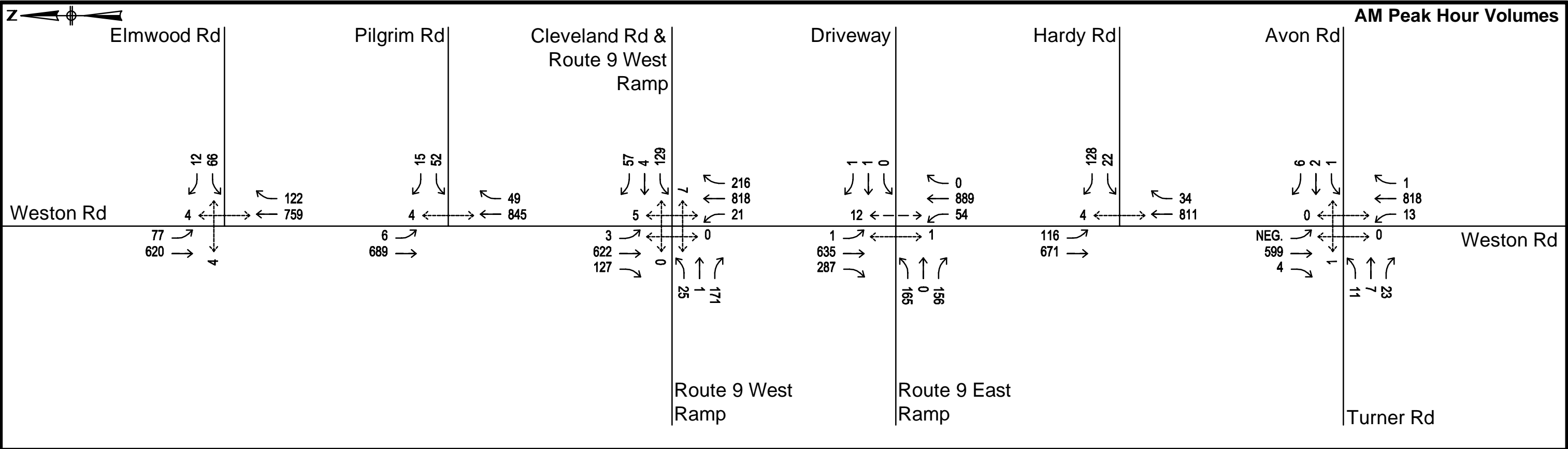
O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

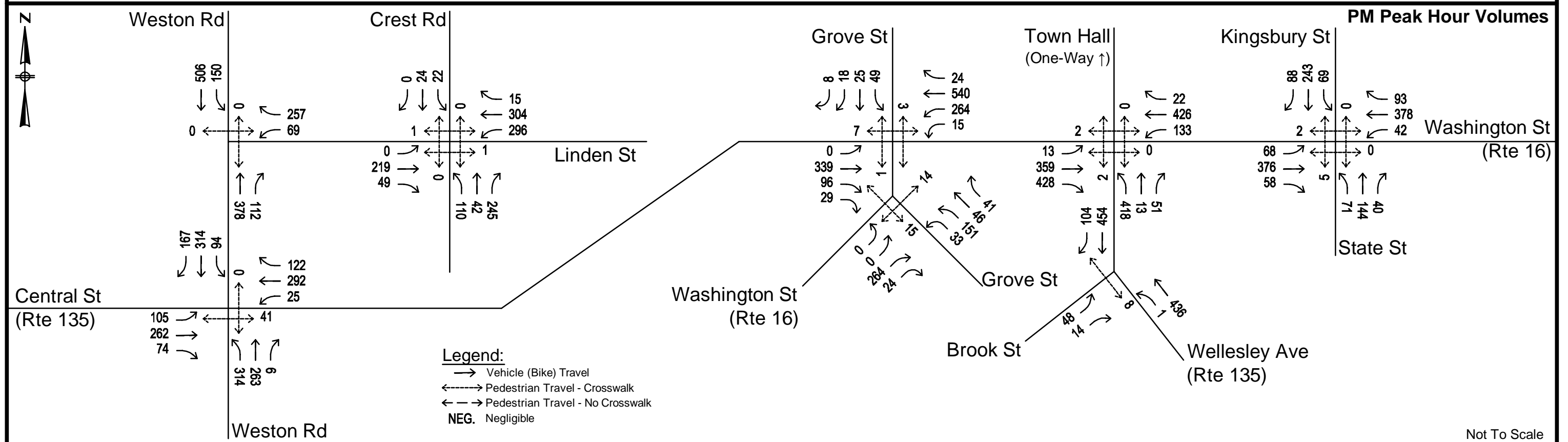
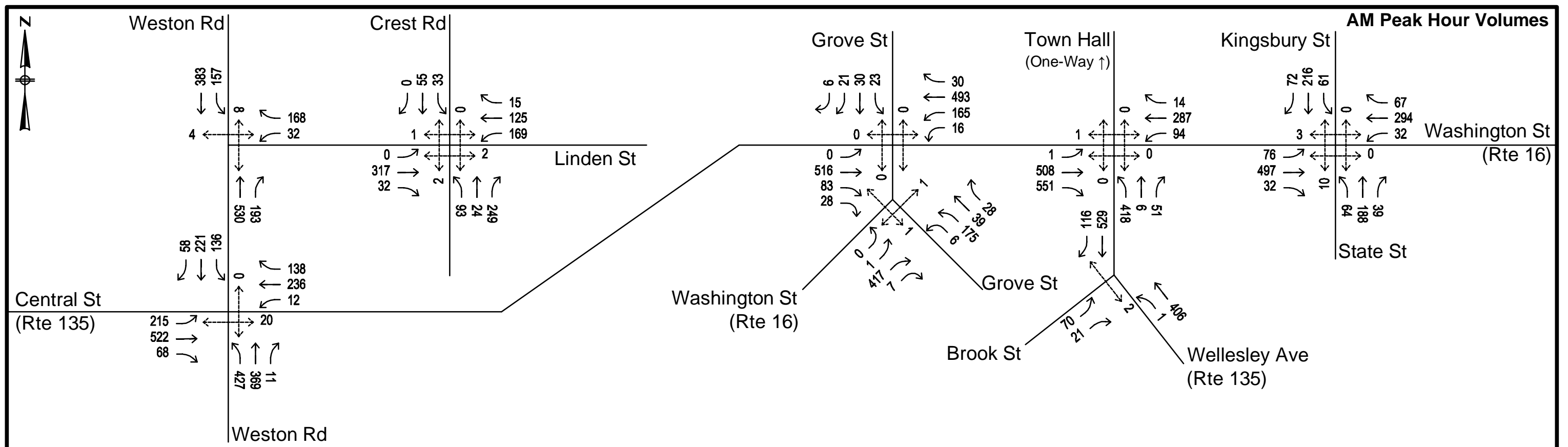
**Figure 7-D**  
2022 Build - Scenario B  
Weekday School Peak Hour Volumes

O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 8-A**  
2022 Build - Scenario D  
Weekday School Peak Hour Volumes



Not To Scale



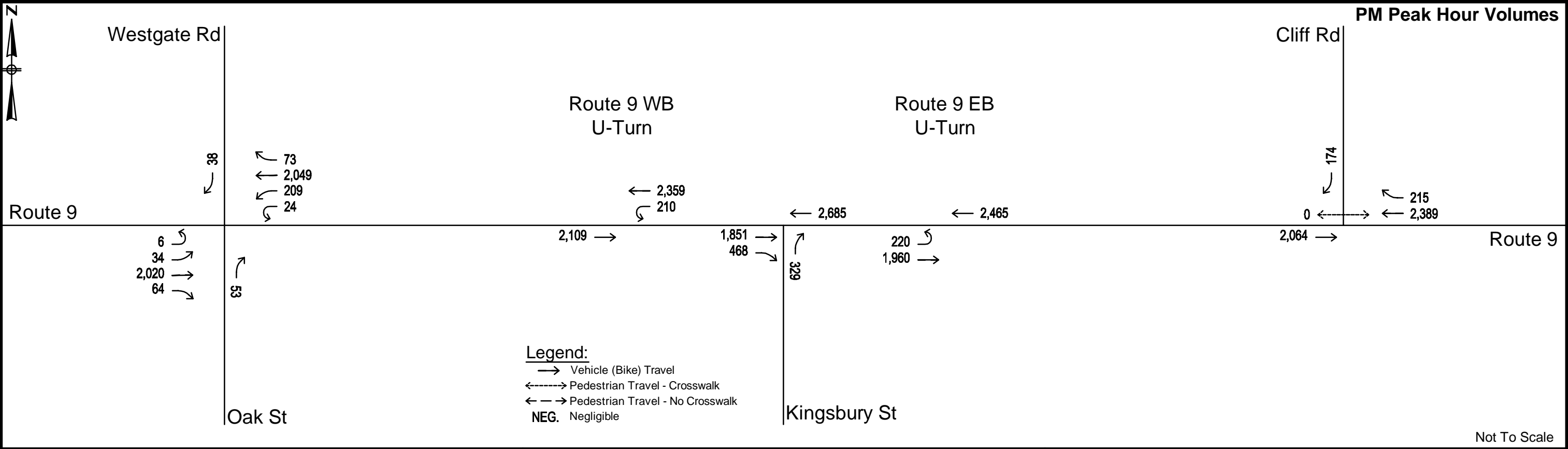
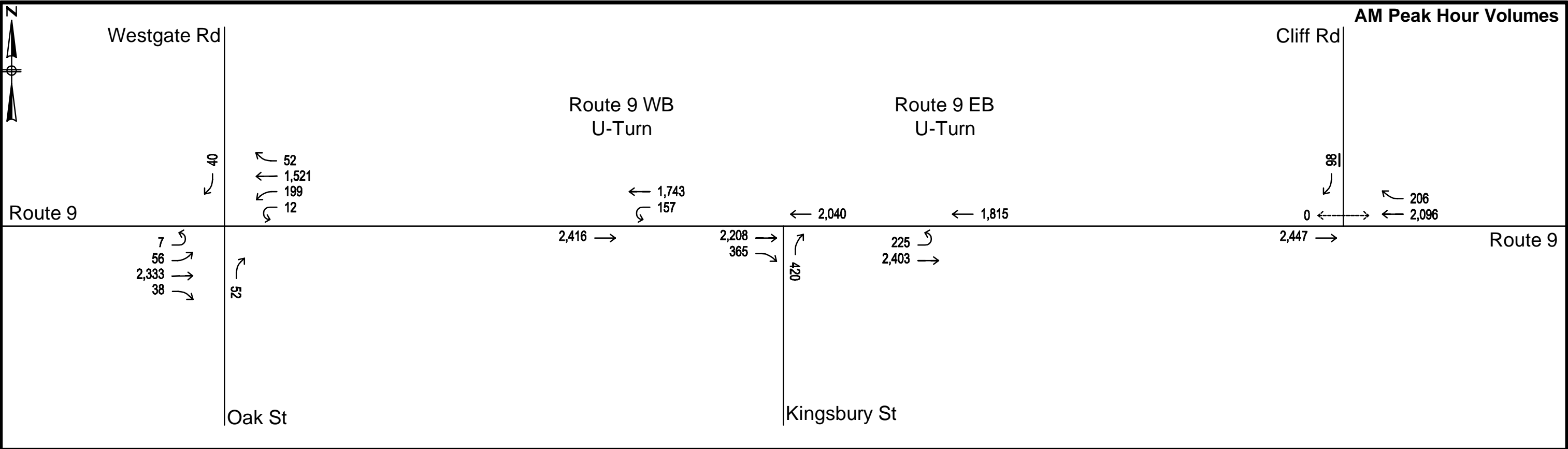
# High Level Traffic Evaluation

## Elementary School Redistricting

Wellesley, MA

**Figure 8-B**  
2022 Build - Scenario D  
Weekday School Peak Hour Volumes

O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



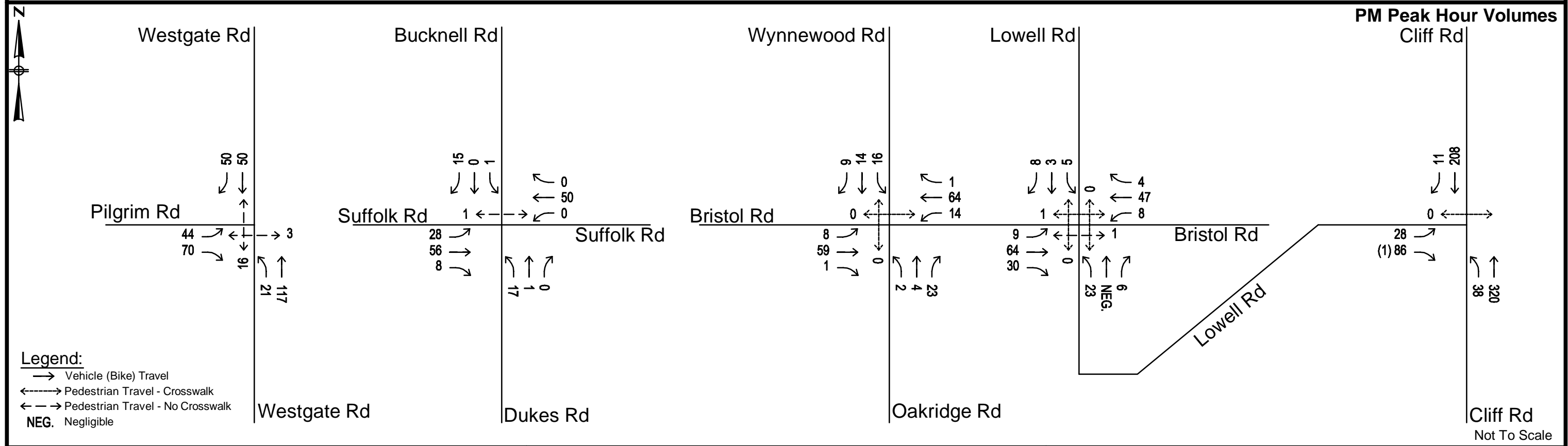
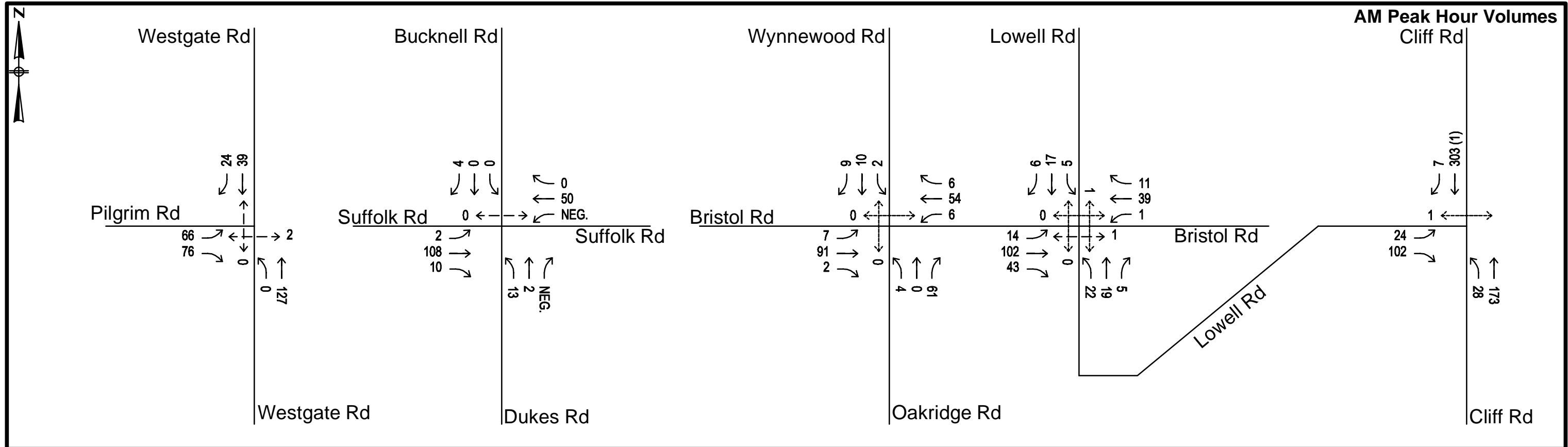
Not To Scale



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 8-C**  
2022 Build - Scenario D  
Weekday School Peak Hour Volumes

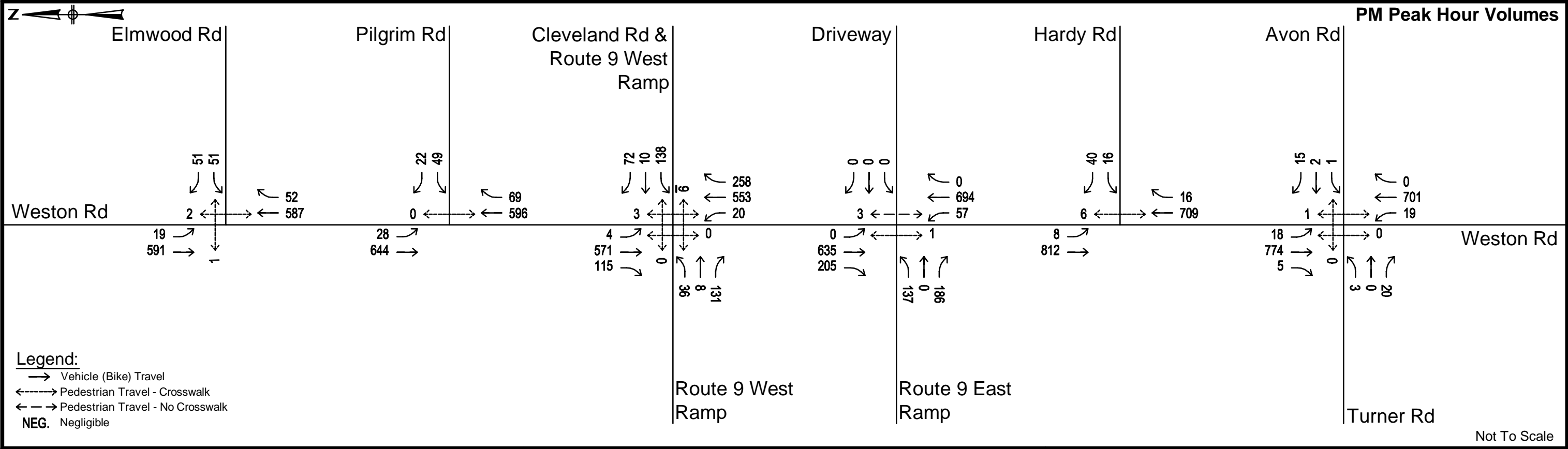
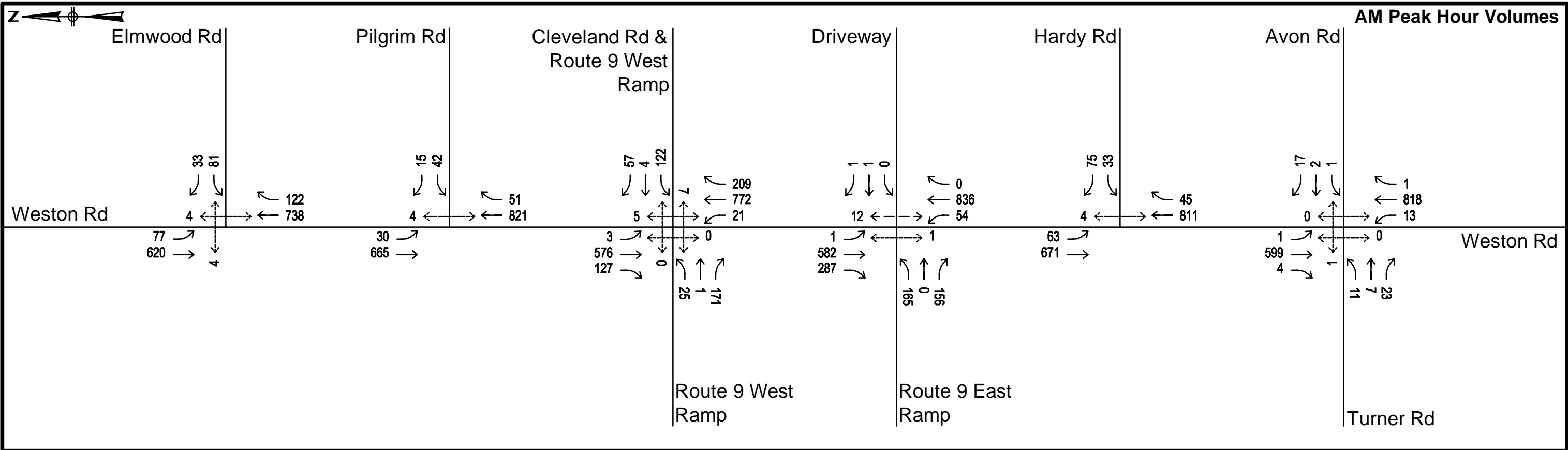
O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 8-D**  
2022 Build - Scenario D  
Weekday School Peak Hour Volumes

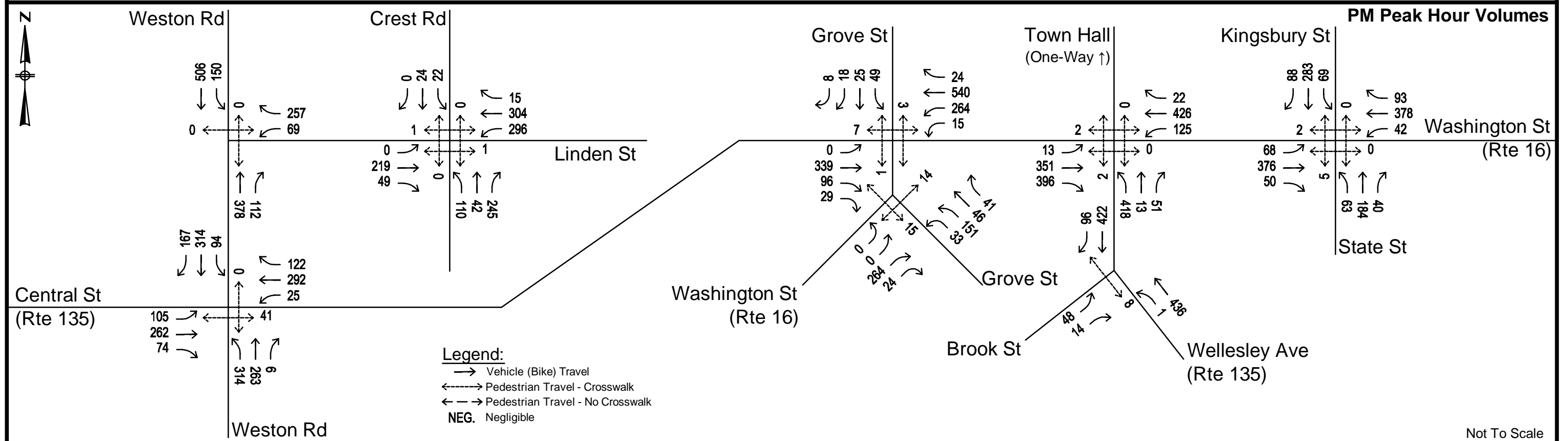
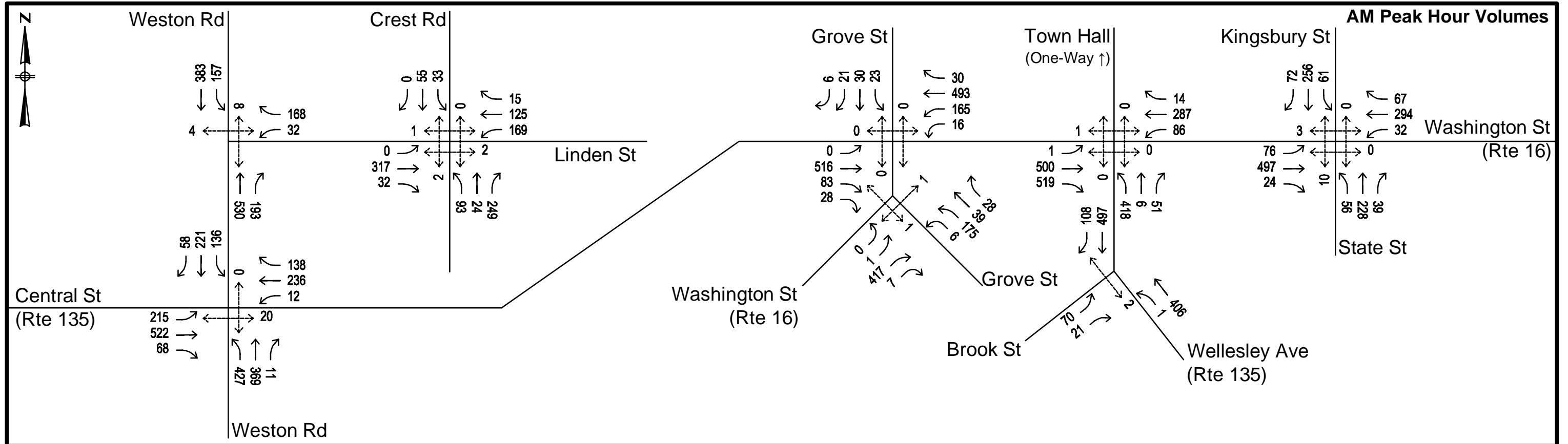




High Level Traffic Evaluation  
Elementary School Redistricting  
Wellesley, MA

Figure 9-A  
2022 Build - Scenario E  
Weekday School Peak Hour Volumes

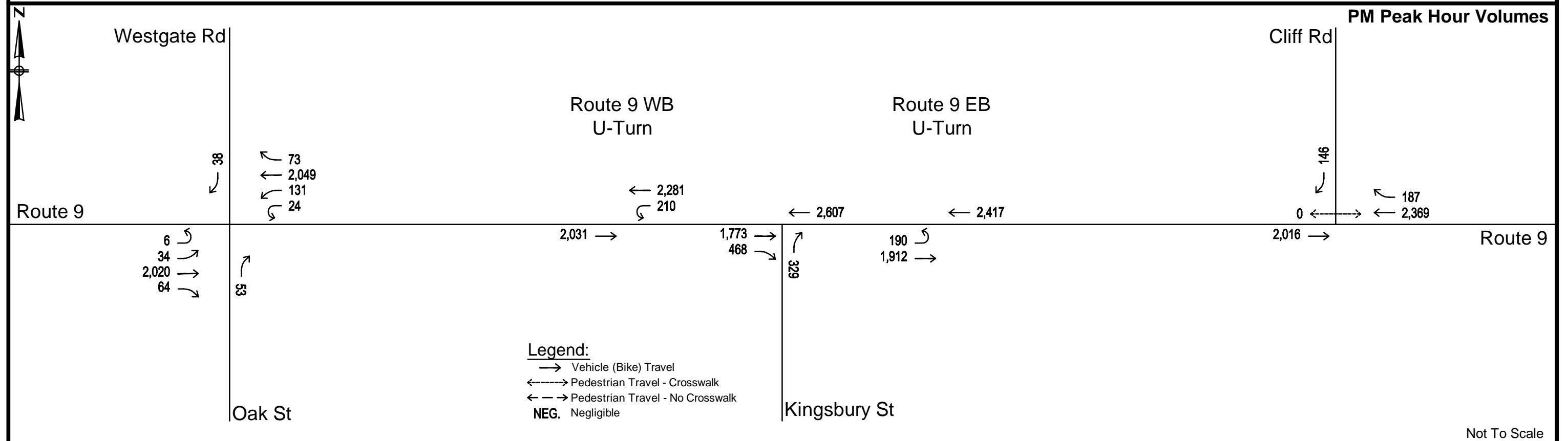
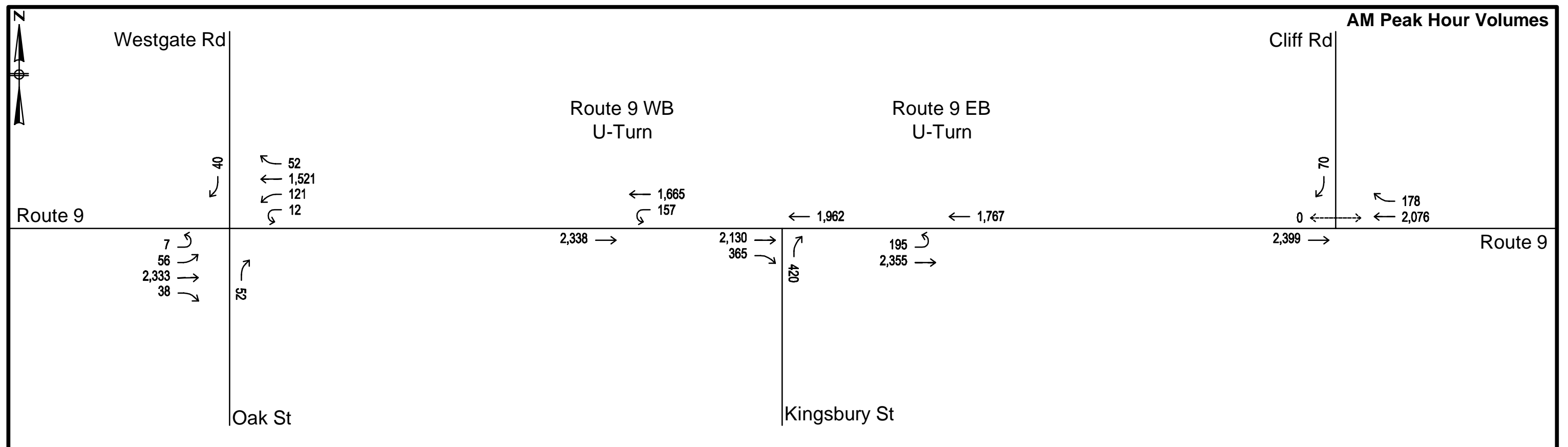
O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



www.BETA-Inc.com

**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 9-B**  
2022 Build - Scenario E  
Weekday School Peak Hour Volumes



Not To Scale



## High Level Traffic Evaluation

### Elementary School Redistricting

Wellesley, MA

Wellesley, MA

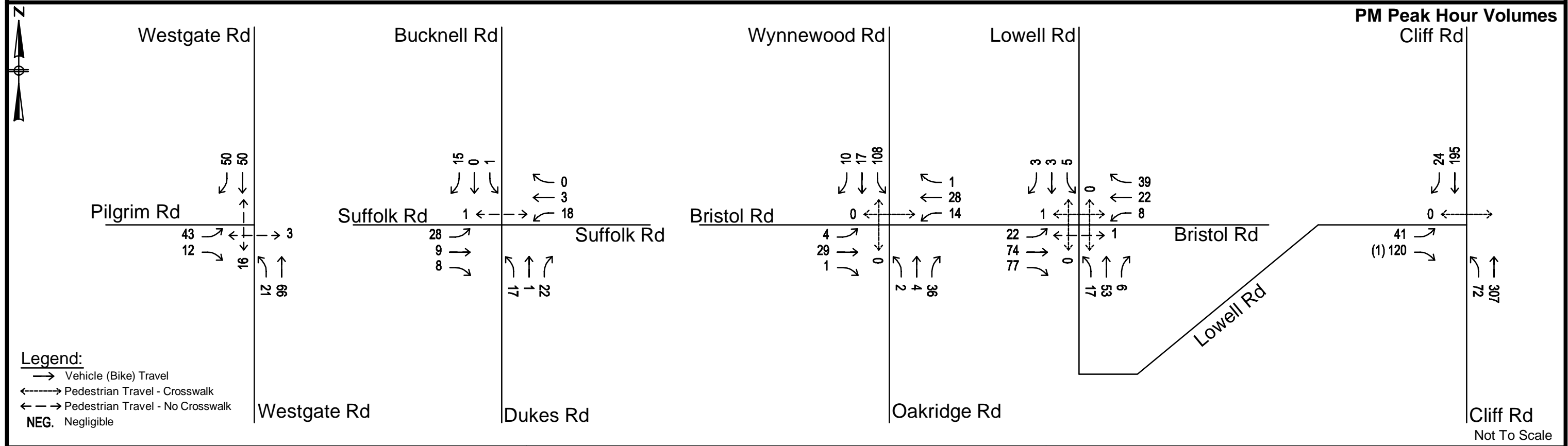
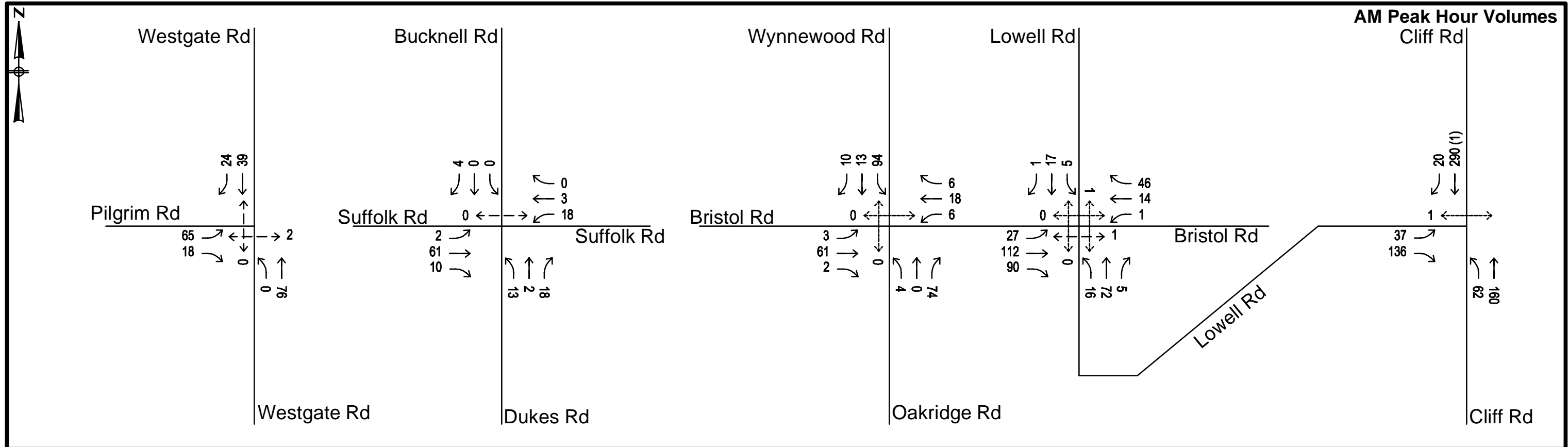
### Figure 9-C

2022 Build - Scenario E  
Weekday School Peak Hour Volumes

### Weekday School Peak Hour Volumes

O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm

O:\5400s\5475 - Wellesley On-Call\Task 2 - School Consolidation\Drawing Files\Plan Set\TMC.dwg Mar 06,2017 7:14pm



**High Level Traffic Evaluation**  
**Elementary School Redistricting**  
Wellesley, MA

**Figure 9-D**  
2022 Build - Scenario E  
Weekday School Peak Hour Volumes